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USEcology

July 9, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Office
Two White Flint North
11545 Rockville Pike
Rockville, Maryland 20852-2738

SUBJECT: Request for Exemption under 10CFR 30.11 for Alternate Disposal of Wastes from the Safety Light Corporation Site, Bloomsburg, PA under 10CFR20.2002

Dear Sirs:

US Ecology, Inc. seeks approval to receive and dispose of 270,000 cubic feet (ft^3) of low-activity radioactive wastes from the Safety Light Corporation (SLC) site in Bloomsburg, PA at US Ecology Idaho (USEI), the company's RCRA subtitle-C hazardous and low-activity radioactive waste facility near Grand View, ID. USEI is regulated by the Idaho Department of Environmental Quality. Idaho is not an NRC Agreement State; however, Idaho regulations and the Grand View RCRA permit provide for the acceptance of this material with the appropriate NRC exemptions. The Environmental Protection Agency (US EPA), in coordination with the Army Corps of Engineers (USACE), requested authorization for alternate disposal of the SLC wastes from the Pennsylvania Department of Environmental Protection (PADEP) since the candidate material at the SLC Site is considered licensed under PADEP's agreement state authority. PADEP granted approval to the EPA's request on June 11, 2013. US Ecology is hereby requesting NRC review and approval of the provided enclosures such that an exemption from the licensing requirements in 10CFR 30.3 may be granted for purposes of disposing the SLC wastes at our USEI facility. This framework is consistent with the scenario #3 for alternate disposals between Agreement States and Non-Agreement States outlined in NRC Agreement State Letter FSME-12-025 (March 13, 2012).

The SLC Site was listed on the National Priorities List (NPL) on April 27, 2005. Presently the SLC Site is the subject of a remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to remove low activity contaminated building debris from the SLC Site. SLC failed to renew its license from the US NRC and complete its responsibilities to decommission and dispose of waste and contaminated equipment at the SLC Site. The SLC has ceased operations at the SLC Site and the EPA is seeking to achieve removal of the buildings as described in the Record of Decision for OU1 at the SLC Site in accordance with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) to address threats to human health and the environment posed by the SLC Site.

A Safety Assessment for the proposed alternate disposal, provided in Enclosure 1, shows that the potential dose to a member of the public is consistent with the NRC's "less than a few millirem per year" criterion. The safety assessment summarizes the characteristics of the candidate SLC waste material including characterization methods and results; the proposed manner and conditions of disposal at USEI; projected doses to members of the public during transport operations and to USEI workers during railcar receipt, unloading, transport and disposal; and an assessment of the potential post-closure doses. The Safety Assessment projects that this proposed alternate disposal would contribute less than 1 millirem to any individual, meeting the NRC's standard of generally limiting alternate disposal exposures to not more than "a few millirem per year" to any member of the public. PADEP performed a thorough review of this Safety Assessment for the alternate disposal request and determined: "*Based on the analyses, this material is authorized for disposal as described in the submission because it poses negligible risk to public health and safety and does not involve information or activities that could potentially impact the common defense and security of the United States. Further, it is in the public interest to dispose of wastes in a controlled environment, such as that provided by a Subtitle C RCRA hazardous waste disposal facility. Therefore, to the extent that this material may be otherwise licensable, it is acceptable for disposal under this 10 CFR 20.2002 request and is exempt from further Department licensing requirements under 10 CFR 30.11*." PADEP has the authority to approve alternate disposal of licensed material pursuant to 25 Pa Code, §§ 215.1 and 219.5 which include by reference both the provisions of 10 CFR 20.2002 for alternative disposal and the authority to issue exemptions under 10 CFR 30.11 (to facilities within the state of Pennsylvania). The approval letter from PADEP to EPA, dated June 11, 2013, is provided in Enclosure 2. Please be advised that the Safety Assessment package performed by the USACE also includes a risk assessment evaluation required by EPA/CERCLA. Since this type of evaluation is not required for purposes of meeting the requirements of 10CFR 20.2002, we respectfully ask NRC to please ignore pp. 109-263 of Enclosure 1.

Finally, we do not believe this submittal meets the standard of a "significant" alternate disposal request, as defined in SECY-07-0060, for the following reasons: the proposed §20.2002 disposal will be in a facility that routinely disposes of large quantities of similar materials in accordance with its permit; and the proposed disposals involve a high degree of certainty that the scenarios and assumptions used for the dose analysis are appropriate, based on past approvals, and will ensure that doses to a member of the public will not be above "a few millirem per year."

If you have any questions or wish to discuss this request further, I can be reached at (208) 319-1634 or jweismann@usecology.com.

Sincerely,

Joseph J. Weismann, CHP
Vice President of Radiological Programs and Field Services
US Ecology, Inc.

ENCLOSURES

Cc: File
Ms. Ann DiDonato, US EPA Region III

Enclosure 1

Letter to Mr. Mitch Cron, US EPA, from Mr. Hans Honerlah, USACE
dated October 16, 2012

RE: USACE-Safety Light Project Evaluation in Support of Alternate Waste Disposal Procedures in accordance with 10 CFR 20.2002 (Safety Assessment)

(269 pages)

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

26 March 2012

REPLY TO
ATTENTION OF
CENAB-EN-HI

United States Environmental Protection Agency, Region III
Attention: Hazardous Site Cleanup Division (Mitch Cron)
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Cron

The purpose of this letter is to summarize the United States Army Corps of Engineers, Baltimore District - Hazardous, Toxic, and Radioactive Waste Design Center's assessment of alternative disposal options for bulk building debris and materials originating from the OU1 remedial action demolition of 13 buildings at the Safety Light Corporation (SLC) Site located at 4150-A Old Berwick Road, Bloomsburg, PA.

<u>SLC Site History</u>

The SLC Site was listed on the National Priorities List (NPL) on April 27, 2005. Presently the SLC Site is the subject of a remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to remove low activity-high volume contaminated building debris from the SLC Site.

SLC failed to renew its license from the US Nuclear Regulatory Commission (USNRC) and complete its responsibilities to decommission and dispose of waste and contaminated equipment at the SLC Site. The SLC has ceased operations at the SLC Site and the Environmental Protection Agency (USEPA) is seeking to achieve removal of the buildings as described in the Record of Decision for OU1 at the SLC Site in accordance with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) to address threats to human health and the environment posed by the SLC Site. The US Army Corps of Engineers (USACE) is supporting the USEPA in the management and cleanup of the SLC Site under an interagency agreement. The USEPA and the USACE are conducting these operations under their respective CERCLA, NCP and interagency agreement authority. The SLC Site is being addressed in three separate operable units (OUs); buildings and debris OU1, ground water OU2, and soils, sediments and surface waters OU3.

Implementation of the OU1 selected remedy in the Record of Decision (ROD) involves demolition of 13 structures. The 13 structures are identified as follows:

- Multi-Metals building
- Carpenter Shop

- Utility building
- Liquid Waste building
- Main building
- 8’x 8’ building
- Machine Shop
- Metal Silo (aboveground)
- Solid Waste building
- Butler building
- Tritium building
- Elevation, Water Tank (adjacent to Main building)
- Water tank (eastern side of Site)

The waste from the OU1 remedial action building demolition is the subject of this request for alternate disposal approval. Enclosure A to this letter documents the results of dose assessments performed to support the alternative waste disposal. Enclosure B documents the results of risk assessments performed to demonstrate that implementation of the proposed alternative waste disposal is protective under CERCLA.

Materials for Alternate Disposal

The radioactive materials contained in the debris from the 13 buildings to be demolished and disposed originate from the operations of the SLC in the production of luminous materials and other commercial products. The radionuclides expected in the bulk waste may include ^{227}Ac, ^{241}Am, ^{60}Co, ^{137}Cs, ^{3}H, ^{63}Ni, ^{237}Np, ^{210}Pb, ^{226}Ra, and ^{90}Sr and are present primarily as surface and volumetric contaminants on walls, ceilings, floors and on other equipment. The volume of building debris is estimated to be approximately 270,000 ft^3.

The planned disposal location for these bulk materials is the US Ecology Idaho Inc. (USEI) Grand View, Idaho Subtitle C RCRA disposal facility. We have determined in consultation with USEI that the Grand View, Idaho RCRA Subtitle C treatment, storage and disposal facility is capable of safely accepting, unloading and disposing of the waste. The facility routinely treats and disposes of radioactive materials that are permitted by its regulatory authority, the Idaho Department of Environmental Quality (IDEQ), to receive exempted, contaminated materials, at concentrations not to exceed conditions specified in the facilities waste acceptance criteria (Enclosure C). The requested concentrations for alternative disposal do not exceed any USEI waste acceptance criteria (WAC). Should material be identified that could cause a shipment to exceed the USEI WAC, those material will be segregated for disposal at an appropriately licensed Low Level Radioactive Waste disposal facility.

By the terms of its RCRA permit, USEI must notify the Idaho Department of Environmental Quality (IDEQ) and complete a state concurrence process set forth in its permit, before it may receive a waste stream exempted by an Agreement State/USNRC. In accordance with state law and regulation, IDEQ requires that material be exempted by an Agreement State/USNRC prior to this concurrence review. IDEQ recently approved a RCRA Class 2 Permit Modification for the USEI RCRA facility allowing for the acceptance of material exempted by the USNRC and/or an Agreement State provided that the concentration of ^{226}Ra does not exceed

222 pCi/g and certain by-product material with the sum of the material not exceeding a total activity of 3,000 pCi/g.

The USACE believes that the material from the OU1 remedial action qualifies for alternate disposal at that Idaho facility since the material in question will comply with the USEI WAC, result in a small dose to members of the public (less than one mrem for this project), and complies with USEI site operational and post closure requirements which limits the dose to maximally exposed individuals (MEI). Analysis performed for the disposal of this waste stream indicates potential exposures of 0.85 mrem to USEI site/SLC Site and/or transportation workers and 0.002 mrem per year to member of the public post USEI site closure.

The results of a risk evaluation performed using reasonably conservative assumptions demonstrate proposed alternative disposal activities are protective under CERCLA. Excess cancer morbidity risk estimates for waste transportation and handling receptors range from 1 x 10^{-6} to 2 x 10^{-7}. Risk to a member of the public post USEI disposal site closure is estimated at 9 x 10^{-8} with an upper bound of 2 x 10^{-5}. These risk estimates fall well within or below the range considered acceptable under CERCLA (10^{-4} to 10^{-6}).

Specifically, the USACE recommends that the USEPA seek approval that the following concentrations be exempt from licensing requirements for the purpose of alternative disposal:

Radionuclide	**Disposal Concentration (pCi/g)**
^{227}Ac	0.3
^{241}Am	5
^{60}Co	0.2
^{137}Cs	25
^{3}H	500
^{63}Ni	60
^{237}Np	0.3
^{210}Pb	140
^{226}Ra	50
^{90}Sr	500

On site procedures at the SLC Site will include sampling and analysis of the waste steam, as well as packaging and surveying of individual waste packages to ensure compliance with WAC for USEI Idaho and this proposed exemption.

Sincerely,

Hans Honerlah, CHMM
Project Manager
USACE, Baltimore District

Enclosures

Enclosure A

ENCLOSURE A

USACE-Safety Light Project
Evaluation in Support of Alternate Waste Disposal Procedures
In accordance with 10 CFR 20.2002

1. INTRODUCTION

The radioactive materials at the Safety Light Site are "licensed" by the State of Pennsylvania and were licensed by the US Nuclear Regulatory Commission (NRC) prior to the State achieving Agreement State status. 10 CFR 20.2001 requires that waste containing licensed material be disposed of at a licensed facility unless specifically authorized. The intent of this evaluation is to provide justification for disposal at an appropriate non-licensed facility in accordance with the provisions in 10 CFR 20.2002.

Approval of the proposed disposal in accordance with 10 CFR 20.2002 would allow the U.S. Environmental Protection Agency, Region 3 (USEPA) to dispose of buildings and debris contaminated with low concentrations of radionuclides from the Safety Light Corporation (SLC) site (Site) located in Bloomsburg, PA at the US Ecology facility located near Grand View, Idaho (USEI). The purpose of this evaluation is to provide the necessary information to support the request for approval of alternative disposal of certain contaminated materials in accordance with the provisions of 10 CFR 20.2002 at an authorized facility and issue exemptions in accordance with 10 CFR 30.11. A description of the material to be disposed is included in Section 3.

The U.S. Army Corps of Engineers (USACE) has worked with USEI to perform a conservative, realistic, dose assessment of the material and determined that the potential dose to the workers involved in the transportation and placement of the material and to members of the general public after site closure will be no more than one millirem per year total effective dose equivalent (TEDE). This dose will be a small fraction of the NRC decommissioning limits for exposure to members of the public of 25 millirem/yr TEDE.

The USEPA and the USACE have developed this request and related safety assessment in consultation with US Ecology, including health physics personnel responsible for the receiving disposal facility's radiological performance assessment.

2. DISPOSAL SITE CHARACTERISTICS

A detailed description of the USEI facility located near Grand View, Idaho is attached (Attachment 1).

3. DESCRIPTION OF THE WASTE

The estimated volume of the waste is approximately 10,000 cubic yards (270,000 cubic feet). The waste is building materials from the planned demolition of 13 structures during implementation of the Safety Light Superfund Site selected remedy in the OU1 Record of Decision (ROD). The 13 structures are identified as follows:

- Multi-Metals building
- Carpenter Shop
- Utility building
- Liquid Waste building
- Main building
- 8'x 8' building
- Machine Shop
- Metal Silo (aboveground)
- Solid Waste building
- Butler building
- Tritium building
- Elevation, Water Tank (adjacent to Main building)
- Water tank (eastern side of Site)

The waste will also include debris and materials associated with and/or contained within the buildings. Radiological contamination is present as surface and volumetric contaminants on walls, ceilings, floors, and on other equipment. Materials within the buildings may include such items as furniture, ductwork, lighting, wiring, process equipment, metal sheet, and some asbestos containing material in the form of roofing, floor tile and siding, etc. The waste material is primarily contaminated with the radionuclides listed in Table 1. The radioactive materials are most probably present in the form of common salts, or in the case of tritium as a water-based compound.

An evaluation was performed to estimate the radionuclide concentrations in the OU1 remedial action wastes. Volumetric sample analysis data was compiled from the OU1 RI and weighted average radionuclide concentrations were estimated for each radionuclide. Radionuclide sample results from the RI were averaged for all samples in the Main Building (including the Ion Exchange Hut) and for all other buildings combined. A weighted average was established for each radionuclide using weighting factors based on the Main Building waste volume estimate (64% of total) and all other buildings volume estimate (36% of total) documented in the FS.

When performing the averaging of RI data, results less than the analytical detection sensitivity (i.e., less than MDA) were considered to equal the detection sensitivity. This is a conservative assumption, especially for gamma spectroscopy analysis results with high activity. In addition, during the RI, sample locations were biased towards areas where contamination was identified or suspected. Based on these observations, it is expected that radionuclide weighted averages overestimate the actual averages that will be generated during the OU1 remedial action.

Table 1 lists the disposal concentrations requested in this evaluation. In most cases, the requested disposal concentration is equal to the weighted average. For some nuclides, professional judgment was used to establish the requested disposal concentration. The ^{226}Ra and ^{137}Cs requested concentrations were set slightly lower than the weighted average; because a few elevated areas skewed the arithmetic averages high. The ^{3}H and ^{90}Sr requested concentrations were set substantially higher than the weighted averages for conservatism; because the radionuclides are hard to detect and RI samples may not have been biased towards locations with elevated ^{3}H and ^{90}Sr concentrations. The requested concentrations in Table 1 are considered to conservatively represent the waste and were used to model potential dose in this evaluation.

The list in Table 1 includes all radionuclides identified in the OU1 ROD (^{227}Ac, ^{60}Co, ^{137}Cs, ^{237}Np, ^{210}Pb, and ^{226}Ra). These radionuclides were detected in site structures during the RI and are considered to be present at concentrations that pose unacceptable risk. During planning for the OU-1 RI and OU-1 removal action, a Historical Site Assessment (HSA) was developed in December 2004. The HSA included an extensive review of SLC licenses, operating records, and radiation surveys to identify radionuclides of concern for OU-1. From these reviews, numerous radionuclides were determined to be present or potentially present in site structures. Many of these radionuclides were detected during the RI and OU-1 removal action. Through implementation of the CERCLA process, the concentrations of these “additional radionuclides” were considered to pose acceptable risk and were not considered radionuclides of concern in the ROD. Nonetheless, they are included here for completeness and conservatism as it is likely that they may be present in the OU-1 waste stream at small concentrations. It should be noted that radionuclides that have decayed through ten or more half lives since their last authorized use and radionuclides that were not identified in excess of background during the RI are not included in this evaluation.

Table 1: Requested Radionuclide Disposal Concentrations

Radionuclide	Requested Disposal Concentration (pCi/g)	Basis	Remarks
^{227}Ac	0.3	weighted average	
^{241}Am	5	weighted average	
^{60}Co	0.2	weighted average	
^{137}Cs	25	professional judgment	Primarily limited to a few elevated areas in the Ion Exchange building and the silo floor (weighted average is 38 pCi/g)
^{3}H	500	professional judgment	Conservative higher value modeled because H-3 is hard to detect (weighted average is 100 pCi/g)
^{63}Ni	60	weighted average	
^{237}Np	0.3	weighted average	
^{210}Pb	140	weighted average	
^{226}Ra	50	professional judgment	Set slightly less than average because single high measurement in carpenter shop skewed average up (weighted average is 57 pCi/g)
^{90}Sr	500	professional judgment	Conservative higher value modeled because Sr-90 is hard to detect (weighted average is 2.5 pCi/g)

Implementation of the OU1 remedial action is not expected to generate RCRA wastes. Following completion of the OU1 EE/CA removal action, an effort was conducted to locate and properly dispose of all RCRA wastes in the OU1 buildings. Although unlikely based on the previous removal effort, it is possible that small quantities of RCRA wastes could be generated. Such waste could include: characteristic metals (D004, D005, D006, D007, D008, D009, D010 and D011); F019 - anodizing wastes; and some D001- oxidizing wastes that may be impacted radiologically. The normal process that generated these listed wastes involved the etching of metals. If encountered, RCRA and Universal wastes will be segregated and initially separated from the main building debris for classification and radiological assessment. These materials, if radiologically impacted will be treated (micro and/or macro-encapsulation) and disposed in accordance with USEI's approved RCRA permit and WAC. In the event that organics are present that require treatment, appropriate methods will be used to treat the organics prior to any stabilization for disposal of other contaminants.

4. RADIOLOGICAL ASSESSMENTS

In the following scenarios the dose equivalent for the Maximally Exposed Individual (MEI) will not exceed a few millirem/yr. This standard of a "few millirem/yr" to a member of the public is defined in NRC Regulatory Issue Summary 2004-08. The State of Pennsylvania has indicated the evaluation should consider the Nation Council on Radiation Protection and Measurements (NCRP) *"Report No.116 Limitation of Exposure to Ionizing Radiation"* for a negligible individual dose of 1 millirem/yr rather than a few millirem/yr.

The radiological assessment presented in this section addresses two separate waste transportation plans to provide flexibility in implementation. Each of these plans is based on disposition of waste materials at USEI; they only differ in transportation logistics. The methods are summarized below:

- **Method 1**: Transport via truck from SLC to licensed transload facility and ship via rail gondola cars to USEI.
- **Method 2**: Package in large debris bags at SLC, transport via truck to local rail siding, transload sealed bags into rail gondola cars, and ship to USEI.

SLC offsite transportation workers and workers at the US Ecology site are treated as members of the public as the US Ecology site is not licensed by the NRC or an agreement state. Evaluations of both potential external and internal dose hazards to transportation and USEI workers, using the requested disposal concentrations in Table 1, are discussed below. Based on length of time of exposure, proximity to the waste, and RESRAD modeling runs to members of the public post closure, the Method 1 MEI is a USEI end-dump truck driver who transports waste from the rail siding to the disposal cell and the Method 2 MEI is a truck driver who transports waste from the Site to the nearby rail siding.

4.1. Waste Transportation Plans

This subsection provides details regarding transportation logistics for each proposed method. As stated previously, this assessment evaluates two separate waste transportation plans to provide flexibility in implementation. The majority of the potentially exposed individuals are common to each transportation plan, as each involves rail transport and disposal at USEI. Table 2 identifies the individuals potentially exposed under each transport method.

Table 2: Individuals Potentially Exposed Based On Transport Method

Individual	Method 1	Method 2
Site Truck Driver to Rail		X
USEI Gondola Surveyor	X	X
USEI Excavator Operator	X	X
USEI Truck Driver	X	X
USEI Cell Operator	X	X

4.1.1. Method 1 Transportation Logistics

As stated previously, the radioactive materials at the Safety Light Site are licensed by the State of Pennsylvania. Waste materials will be managed as licensed radioactive materials until they are packaged for transport to USEI for disposal. For the purpose of transport efficiency, waste materials will be trucked from the Site to the Alaron Nuclear Services facility in Wampum, PA and transloaded into rail gondola cars in Alaron's licensed facility. The waste will be considered packaged for transport to disposal when Alaron releases gondola cars to the rail. The gondola cars will be transported to USEI via rail and disposed of using USEI standard waste handling practices. Specific steps in the waste disposition plan are outlined below:

- **Package in intermodal**: Waste will be packaged at the Site in 25 cubic yard intermodal containers.
- **Transport to Alaron**: Intermodal containers will be transported via truck (one per truck) to the Pennsylvania-licensed Alaron Nuclear Services facility in Wampum, PA.
- **Alaron takes possession**: Alaron will "receive" the waste materials and take possession of them under their PA radioactive materials license.
- **Transload into gondolas**: Alaron will "transload", or repackage the waste materials into gondola rail containers with an approximate capacity of 100 cubic yards (approximately 100 total gondola cars).
- **Alaron relinquishes possession**: Licensed activities with the waste will terminate when Alaron releases loaded gondolas from their facility.
- **Gondola rail transport to Idaho**: Loaded gondolas will be transported via rail to the rail siding approximately 30 miles from the USEI Grandview Idaho disposal cell.
- **USEI rad receipt survey**: USEI workers will perform a radiological receipt survey of the gondola.
- **USEI transload into end-dumps**: USEI workers will transload the waste materials from the gondola containers into end-dump trucks using an excavator.

- **USEI transport to cell**: Loaded end-dumps will transport waste to the disposal cell and transfer waste to the disposal cell (approximately 450 truck loads).
- **USEI compacts waste**: A USEI worker will compact the materials in the disposal cell using a Caterpillar D9 bulldozer.

Based on the disposition plan, many of the waste management activities are performed by radioactive materials licensees. It is expected that such activities will be performed safely, within applicable administrative ALARA limits, and in accordance with approved Radiation Safety Plans or Radiation Protection Plans. As a result, this assessment does not evaluate potential doses to individuals during licensed activities. Consistent with the requirements in 20.2002, this assessment evaluates potential doses to members of the general public resulting from activities that are not performed under a license. These activities include all transportation and handling of waste materials after they are released from Alaron.

4.1.2. Method 2 Transportation Logistics

Waste materials will be managed as licensed radioactive materials onsite until they are packaged for transport. For the purpose of transport efficiency, waste materials will be packaged in 20 cubic yard super sacs, trucked from the Site to the Berwick, PA rail siding, and transloaded into high sided rail gondola cars. The gondola cars will be transported to USEI via rail and disposed of using USEI standard waste handling practices. Specific steps in the waste disposition plan are outlined below:

- **Package in super sac within roll-off container**: Waste will be packaged at the Site in 20 cubic yard super sacs. The super sacs will be staged in 25 cubic yard roll-off containers and filled in place. The super sac serves as the DOT shipping container.
- **Transport to Berwick**: Roll-off containers will be transported via tractor trailer roll-off truck (one per truck) to the rail siding in Berwick, PA approximately 15 miles from the Site (approximately 500 truckloads).
- **Transload into gondolas**: Super sacs will be transloaded into high sided gondola rail cars using a crane. Five super sacs will be loaded into each gondola car (approximately 100 total gondola cars).
- **Gondola rail transport to Idaho**: Loaded gondolas will be transported via rail to the rail siding approximately 30 miles from the USEI Grandview Idaho disposal cell.
- **USEI rad receipt survey**: USEI workers will perform a radiological receipt survey of the gondola.
- **USEI transload into end-dumps**: USEI workers will transload the waste materials from the gondola containers into end-dump trucks using an excavator.
- **USEI transport to cell**: Loaded end-dumps will transport waste to the disposal cell and transfer waste to the disposal cell (approximately 450 truck loads).
- **USEI compacts waste**: A USEI worker will compact the materials in the disposal cell using a Caterpillar D9 bulldozer.

4.2. Site Transport Worker Dose Assessment

The Site transport worker is unique to transport Method 2.

The 20 cubic yard super sacs will be staged in 25 cubic yard roll-off containers to facilitate loading and allow truck transport without the need for a crane at the Sire. Tractor trailer trucks with roll-off trailers (sometimes referred to as "rocket trailers") will be used to transport the containers to the rail siding in Berwick, PA. Based on the anticipated total waste volume, approximately 500 truck loads will be required. The dose to driver is modeled using the dose rate as calculated by MicroShield® for the target radionuclides in the truck at two meters multiplied by the time to transport the waste divided by the number of drivers (see Attachment 2).

MicroShield® is a comprehensive photon/gamma ray shielding and dose assessment program/tool that is used industry wide for the design of shields, estimation of source strength from radiation measurements and scenario modeling. The tool is fully interactive and utilizes extensive input error checking. Data used to perform the calculations is extensively tested and referenced. Additional information on the program can be found at: http://www.radiationsoftware.com/mshield.html.

The time to transport the waste from the Site to the Berwick rail siding and "drop" the container is approximately 30 minutes and is a shared task amongst 3 drivers. The estimated dose rate to the truck driver is 0.0102 mrem/hour. Based on the number of drivers and estimated loads, the dose to the driver during implementation of the OU-1 remedial action is approximately 0.85 mrem.

There should be no credible dose from inhalation during transportation, considering the waste will be packaged in accordance with appropriate Department of Transportation requirements.

4.3. USEI Radiological Receipt Survey Worker Dose Assessment

The USEI radiological receipt survey worker is common to both transport Methods 1 and 2.

Gondola cars will be received by USEI at the rail siding. Prior to being transloaded into end-dumps, each car will be surveyed. The dose to the surveyor is modeled using the dose rate as calculated by MicroShield® for the target radionuclides in the container at one meter multiplied by the time to conduct the survey divided by the number of USEI workers who perform the surveys (see Attachment 3).

The time to conduct the survey averages 20 minutes. Surveys are performed by eight USEI workers. The estimated dose rate to the surveyor is 0.0304 mrem/hour. Based on the number of workers and estimated number of gondola conveyances, the dose to the surveyor during implementation of the OU-1 remedial action is approximately 0.13 mrem.

There should be no credible dose from inhalation during surveying, considering the waste will be packaged in accordance with appropriate Department of Transportation requirements.

4.4. USEI Rail Transload Worker Dose Assessment

The USEI rail transload worker is common to both transport Methods 1 and 2.

Waste will be removed from gondola cars and transferred into end-dumps at the rail siding using an excavator. The dose to the excavator operator is modeled using the dose rate as calculated by MicroShield® for the target radionuclides in the container at two meters multiplied by the time to conduct the survey divided by the number of USEI operators who perform the transload (see Attachment 4).

The time to conduct the transload averages 45 minutes and is a shared task amongst four excavator operators. The estimated dose rate to the excavator operator is 0.0175 mrem/hour. Based on the number of workers and estimated number of gondola conveyances, the dose to the operator during implementation of the OU-1 remedial action is approximately 0.33 mrem.

The excavator operator is in a HEPA ventilated enclosed cab which is assigned a protection factor of 10. Work practices, respiratory protection, the low concentrations of radionuclides in the waste, and historical data provide reasonable assurance that the dose from inhalation of radionuclide contaminated particles will be insignificant.

4.5. USEI Transport Worker Dose Assessment

The USEI transport worker is common to both transport Methods 1 and 2.

Loaded end-dump trucks will transport the waste from the rail siding into the disposal cell. The end-dump trucks have a capacity of just over 22 cubic yards for this type of waste. Based on the anticipated total waste volume, approximately 450 truck loads will be required. The dose to driver is modeled using the dose rate as calculated by MicroShield® for the target radionuclides in truck at one meter multiplied by the time to transport the waste divided by the number of drivers (see Attachment 5).

The time to transport the waste from the rail siding and empty it in the cell is approximately 45 minutes and is a shared task amongst 14 drivers. The estimated dose rate to the truck driver is 0.0270 mrem/hour. Based on the number of drivers and estimated loads, the dose to the driver during implementation of the OU-1 remedial action is approximately 0.65 mrem.

There should be no credible dose from inhalation during transportation, considering the waste will be packaged in accordance with appropriate Department of Transportation requirements.

4.6. USEI Disposal Cell Worker Dose Assessment

The USEI disposal cell worker is common to both transport Methods 1 and 2.

Loaded end-dumps will transport waste materials from the rail siding to the cell and their contents will be emptied into the cell. Materials deposited in the cell are then spread in lifts of approximately one meter and compacted by running over them with a D9 caterpillar. The dose to the D9 operator is modeled using the dose rate as calculated by MicroShield® for the target radionuclides spread over the surface at two meters multiplied by the time to conduct the survey divided by the number of USEI operators who perform the task (see Attachment 6).

The time to spread the volume of material in one gondola averages 15 minutes and is a shared task amongst two workers. The estimated dose rate to the D9 operator is 0.0397 mrem/hour. Based on the number of workers and estimated number of gondola conveyances, the dose to the D9 operator during implementation of the OU-1 remedial action is approximately 0.50 mrem.

All workers are required to wear respirators while in the cell. Workers are provided with half-face respirators which are assigned a protection factor of 10. Work practices, respiratory protection, the low concentrations of radionuclides in the waste, and historical data provide reasonable assurance that the dose from inhalation of radionuclide contaminated particles will be insignificant.

4.7. Summary of Estimated Doses

Table 3 summarizes the results of MicroShield® modeling and the assumptions used to estimate worker doses.

Table 3: Summary of Estimated Doses

Job Function	# of Workers	Minutes to perform task	Distance from object (meters)	Type of conveyance modeled	Number of Conveyances	External dose rate (mrem/hr)	Total (mrem)
Site Truck Driver	3	30	2	Truck and Trailer	500	0.0102	0.85
Gondola Surveyor	8	20	1	Gondola	100	0.0304	0.13
Excavator Operator	4	45	2	Gondola	100	0.0175	0.33
USEI Truck Driver	14	45	1	Truck	450	0.0270	0.65
Cell Operator	2	15	1	Gondola	100	0.0397	0.50

4.8. Post Closure Dose to the General Public

US Ecology's permit requires that it demonstrate that no person will receive a dose exceeding 15 millirem for 1000 years after closure of the facility. RESRAD was used to make that demonstration. RESRAD (Residual Radioactive Material) is an industry standard software program, written by Argonne National Laboratories, which is used to evaluate human health dose from residual contamination. The U.S. Nuclear Regulatory Commission also has approved use of RESRAD for dose evaluation for decommissioning and waste disposal at licensed nuclear facilities and several state agencies have approved the use of RESRAD for evaluating site cleanup activities. Additional information on RESRAD and the entire RESRAD family of codes can be located at: http://web.ead.anl.gov/resrad/home2/.

The contribution to post-closure dose from placing the waste from the Safety Light Corporation was evaluated by assuming the total activity of each radionuclide in the waste was added to the volume of the "contaminated zone" with no other radionuclides present. Concentrations and activities of the radionuclides in the "contaminated zone" were determined by mixing in a total volume of approximately 2.5 x 10^6 yd^3 with an average density of 1.5 g/cm^3 within this disposal cell. The total estimated input activity from the Safety Light debris was determined by using the estimated volume of the debris, multiplying by the density of the waste observed during the OU1 EE/CA removal action (1.2 g/cm^3) and then multiplying by the requested disposal concentrations from Table 1. The resultant waste concentration in the disposal cell is listed on page 14 of Attachment 7. Other modeling parameters to the RESRAD run, such as hydrology, contaminated zone thickness, etc., are listed in the attached RESRAD evaluations and are the approved standard parameters as submitted and approved for the USEI disposal permit.

The results of the RESRAD modeling, Attachments 7 and 8, demonstrate there will be no post-closure dose of significance contributed by the Safety Light waste. The maximum dose equivalent to a member of the public post closure is calculated to be approximately 0.002 mrem per year.

5.0 ADMINISTRATIVE CONSIDERATIONS FOR DISPOSAL

This section briefly discusses some of the controls and surveillance that USEI conducts to ensure the protection of workers, members of the public, and the environment.

The Grand View facility is a hazardous waste treatment, storage and disposal facility permitted under Subtitle C of RCRA and the Toxic Substances Control Act (TSCA). The facility is permitted to treat and dispose of RCRA and TSCA wastes, as well as a wide range of low-activity radioactive wastes and Naturally Occurring Radioactive Material (NORM/NARM), Technologically Enhanced NORM (TENORM) and other wastes exempted from federal regulation (by the U.S. Nuclear Regulatory Commission and/or an Agreement State) from other government and industrial customers. Permit requirements ensure that USEI performs routine environmental sampling and analysis, training of personnel, and maintains adequate administrative controls to ensure the protection of workers, members of the public, and the environment.

5.1 Off-Site Rule

The Off-Site Rule (OSR) was promulgated on September 22, 1993 (52 FR 49200). The regulatory citation is 40 CFR 300.440. It requires that CERCLA wastes may only be placed in a facility operating in compliance with the RCRA or other applicable Federal or State requirements. The purpose of the OSR is to avoid having CERCLA wastes from response actions authorized or funded under CERCLA contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound.

USEI's disposal facility routinely receives hazardous and radioactive wastes from CERCLA facilities. As such, USEPA Region 10 routinely performs determinations of USEI's compliance with the OSR. At the time of this writing, USEI was in compliance with the OSR. Prior to shipping any SLC waste to USEI, USEPA Region 10 will be contacted to ensure USEI is in compliance with the OSR. In addition, this will be confirmed every 60 days thereafter if shipping activities are planned or in progress.

5.2 USEI Disposal Facility Groundwater Monitoring

USEI has twenty (20) piezometers and thirty-eight (38) monitoring wells screened within two saturated zones designated as aquifers below the site.

Specific Conductivity, pH and a custom list of 28 VOCs are sampled semi-annually in accordance with USEI Part B RCRA and TSCA Permits. Sampling for PCB analysis is performed each year. Groundwater sampling is performed in accordance with the requirements of USEI's current operating permit. Analysis is completed by a certified contract laboratory.

As a result of the acceptance, treatment (if applicable) and disposal of low activity radiological materials, environmental media (i.e., soil, air and groundwater) are sampled and analysis is performed annually for radionuclides that have been managed and/or disposed at the facility. Radon and passive gamma are also monitored at the facility fence line to demonstrate compliance with appropriate regulations.

The results of the semi-annual and annual groundwater sampling and analysis activities are submitted to IDEQ semi-annually, in accordance with the requirements of USEI's RCRA Part B Permit, and to U.S. EPA Region 10 each year, in accordance with the requirements of USEI's TSCA Permit.

5.3 Radiological Protection for USEI Workers

Radiological protection at USEI is controlled trough implementation of USEI's *Radiological Health and Safety Manual*, dated July 2008. The Manual establishes policies, engineering practices, training requirements, and protection standards to ensure workers and members of the public are protected from the potentially adverse effects of ionizing radiation exposure.

The regulations of the U.S. Nuclear Regulatory Commission allow adult radiation workers to receive an annual whole body radiation dose of 5,000 millirem (mrem). The regulations of the Occupational Safety and Health Administration (OSHA) allow adult radiation workers to receive an annual whole body radiation dose of 5,000 millirem (mrem), not to exceed 1,250 mrem in any calendar quarter. The limit for worker dose at USEI has been set at 500 mrem per year, or 10% of the NRC's and OSHA's annual limit (see Table 4). At NRC-licensed facilities, workers who are expected to receive annual doses of less than 500 mrem are not required to wear individual radiation measuring devices. At OSHA-regulated sites, workers must be badged only if they are expected to receive annual doses of more than 1,000 mrem.

External radiation doses to USEI employees are measured by the individual monitoring badges issued to all employees. Personnel doses due to inhalation of particulate radioactive materials are monitored by periodically sampling the air in the vicinity of workers at the RTF and the Site B disposal trench. Worker radiation doses at USEI are consistently less than 10 mrem per year per person.

Table 4: USEI Dose Limits

Category	**Dose Limit (mrem)**
Adult Radiation Worker	5,000 per year
Radiation Worker under age 18	500 per year
Pregnant Radiation Worker	500 per 9-month pregnancy
Member of the Public (non-radiation worker)	100 per year

6.0 CONCLUSION

The USACE believes the evaluations above successfully demonstrate that the potential dose equivalent to any individual member of the general public (including USEI site workers and transportation workers whom are considered to be members of the general public) will be less than one millirem (10 µSv) for the year as a result of the transfer, treatment and disposal of the building debris and associated materials from the SLC building demolition.

Attachment 1

GENERAL DESCRIPTION (IDAPA 58.01.05.012 & 40 CFR 270.14(B)(1))

US Ecology Idaho (USEI) owns and operates an approximately 160-acre RCRA Subtitle C Treatment, Storage and Disposal Facility (TSDF). This facility is located at the end of Lemley Road approximately 10½ miles west of the town of Grand View, Owyhee County, Idaho.

The site had previously operated as a waste storage and landfill disposal facility by a different owner from 1973 to 1981. Current activities at this facility include storage, treatment, and disposal at an on-site landfill(s) of industrial, toxic and hazardous wastes and certain low activity radioactive materials . USEI serves multiple industries including chemical, manufacturing, steel, petroleum and pharmaceutical industries as well as the federal government. Wastes are generated on-site from various site activities. These activities include leachate generation from landfills, liquids collected from various containment areas/systems and other waste streams generated during the operation of various on-site waste management units including the Stabilization Facility, Stabilization Building, Containment Building, various container management units, landfill(s), surface impoundments, and other existing hazardous waste management units and support facilities.

The active disposal portion of the facility is comprised of two (2) active landfill disposal cells, designated as Cells 14 and 15 and four (4) surface impoundment disposal units, designated as the Evaporation Pond and Collection Pond #'s 1, 2 and 3. Additionally, there are two landfill disposal units, Trenches 10 and 11, which completed a five year evaporative cap performance demonstration which began during the year 2000 and are now closed. Former Trench 5 has also been closed using a standard RCRA facility cap.

Historically, the site was primarily used for management of non-hazardous and hazardous wastes, and PCB under a separate TSCA permit. Throughout the 1970's, the facility was operated by Wes-Con, Inc. as an industrial waste landfill and received wastes for disposal in the abandoned on-site Titan missile silos and then active chemical waste landfill. In 1980 Wes-Con, Inc. (Now operated by USEI) obtained interim status under RCRA for management of hazardous wastes, including treatment, storage and disposal of approved hazardous wastes. USEI received a "Hazardous Waste Treatment, Storage and Disposal Facility Permit" from U.S. EPA and IDEQ on December 15, 1988.

The Grand View, Idaho waste management facility has been in operation since 1973. Prior to the purchase of the facility by USEI, portions of the Titan missile silo complex were used for waste disposal in addition to the on-site trenches. Because of the timing of the USEI purchase of the site and the promulgation of current environmental regulations, the only information available regarding past disposal practices is the records that were maintained at the facility by previous owners and information that USEI has been able to obtain from past owners and long-term employees at the site.

In recent years, the facility has accepted large volumes of low activity radioactive material from the federal government's Formerly Utilized Site Remedial Action Program (FUSRAP), other federal agencies, and private entities including NRC and Agreement State licensees. These materials include naturally occurring and accelerator produced radioactive material in low concentrations, as well as source and byproduct material generally or specifically exempted from regulation under the Atomic Energy Act for disposal purposes.

General Hydrogeologic Information

Regional Setting

Introduction

The following is a summary of the Physiographic Setting and Regional Hydrogeology of USEI Site B presented in the 1986 Site Characterization Report (CH2M HILL, February 1986). This information has been assembled pursuant to IDAPA 58.01.05.012 (40 CFR 270.14(c)(2)).

Physiography

USEI Site B is situated in the western portion of a 20,000-square-mile physiographic unit known as the Snake River Plain. The plain extends from the vicinity of Ashton, Idaho, to north of Ontario, Oregon. The Snake River Plain is approximately 350 miles in length and varies in width from 25 to 75 miles. USEI Site B lies within the lowland area of the Owyhee subunit of the Snake River Plain at an elevation of between 2,525 ft. and 2,635 ft.

The Snake River, which flows to the northwest, lies approximately three (3)miles east of the site and is the most prominent water resource of the area. The site is approximately 250 ft. higher than the Snake River flood plain, which locally extends outward up to one mile along either side of the river. Castle Creek, a perennial stream that flows northward to the Snake River, lies approximately one mile west of Site B. Cloudburst Wash, a small ephemeral (intermittent) stream, lies about two (2) miles to the east of Site B and also empties into the Snake River. The facility straddles the Castle Creek and Cloudburst Wash drainage basins. However, since the facility contains all runoff from active areas, it does not contribute runoff to either drainage. The area is characterized by badlands-type topography and exhibits varied relief. Major topographic features of the area include several prominent buttes, remnant basaltic cinder cones, and canyons cut by the Snake River. Vegetation in the area is typical of a semiarid environment. The lowland area within which the site is located is inhabited by low brush and grasses, including sagebrush, rabbit brush, wheat grass, and cheat grass. Land use in the area consists of undeveloped rangeland and some limited irrigated agriculture. Irrigation water in the area is derived from the Snake River, Castle Creek, and from the deep, regionally extensive, geothermal groundwater system. The area is sparsely populated with isolated farms and ranches being the dominant habitation.

Climate

The semiarid western portion of the Snake River Plain has one of the highest annual average temperatures in the state. For a 64-year period (1933 to 1996) at the Grand View U.S. Weather Bureau Station, located ten (10) miles east of the site, the average temperature was 52.2 degrees Fahrenheit (EarthInfo, Inc., 1997). The range in temperature during the winter months of December through February was -1 degree Fahrenheit to 58 degrees Fahrenheit. From March to November, the temperatures ranged from 12 degrees Fahrenheit to 101 degrees Fahrenheit.

The site is influenced by prevailing westerly maritime winds via the Columbia River and Snake River valleys; consequently, most precipitation falls during the winter. Over the same 64-year period at the Grand View U.S. Weather Bureau Station, the average annual total precipitation was 7.1 inches. The precipitation in this area is evenly distributed from November through June, with only a minor amount falling during the summer, usually associated with isolated thunderstorms. The mean annual pan evaporation for the Grand View area is approximately 53 inches (U.S. Weather Bureau, 1959).

Regional Well Inventory

A records search of the well log files at the Idaho Department of Water Resources (IDWR) in March 2003 turned up 26 logs for wells installed within a 3-mile radius of Section 19. There were no new wells drilled in this search area between the 1998 and current submittals of this permit application document. Note that the test well LP-40 discussed previously was not included in this summary.

Figure E-6 shows the approximate location of the wells based on the location information included on the log. Included in Figure E-6 is a table showing the well depth, date drilled, and stated use. Four (4) of the well logs were for USEI monitoring wells and there were two duplicate logs filed for the same well (well No. 13). The plugged and abandoned water well exploratory well drilled west of Site B by USEI to a depth of 800 ft. is shown as well No. 18 and the plugged and abandoned deep artesian well drilled by the U.S. Air Force in 1958 is shown as well No. 14. Appendix E.1 provides copies of the well logs as filed with IDWR.

There are five existing wells in the immediate vicinity of Site B that are of interest because they may be hydraulically downgradient of the facility. Four of these wells, Nos. 12, 13, 21, and 22, are domestic wells that probably cannot be impacted by shallow groundwater at Site B because they are deep artesian wells (greater than 600 ft. deep) and either flow at the surface or have very shallow static water levels (less than 12 ft. bgs). The fifth well, No. 23, was drilled for stock watering and draws water from sands and gravels with a reported yield of over 50 gallons per minute. The location provided on the Well Drillers Report places this well about 1.5 miles west of the Snake River (one mile east of Site B) in an area where saturated gravel deposits are not expected. However, in a telephone interview with the owner of the well, the actual location of the well is approximately ½ mile west of the Snake River and 50 ft. northwest of the Grand View Irrigation Canal. This places the well approximately 2.0 miles east of Site B in the NW ¼ NE ¼ of Section 21 as shown in Figure E-6, not NW ¼ NE ¼ of Section 20 as stated on the Well Driller's Report. Based on well No. 23's proximity to the Snake River and the irrigation canal, and the lithology provided in the Well Drillers Report, this well apparently draws water from saturated gravels that are recharged by the Snake River and possibly the canal. Thus, well No. 24 will not likely be impacted by shallow groundwater at Site B.

Regional Geology

Several investigators have been active in the delineation of the geology of the area at the regional scale. Malde and Powers (1962), Littleton and Crosthwaite (1957), Anderson (1965), and Ralston and Chapman (1969) have all contributed to establishing the geology of southwestern Idaho, including the general area of Site B. The information from these researchers is summarized and synthesized in this section to provide an overview of the geologic setting. The intent of this section is not to provide a definitive and detailed examination of the geology of the area, but only to place the site in the regional geologic framework as a basis for the detailed site geology and hydrogeology.

Stratigraphy

The regional stratigraphy of the area is dominated by the Idaho Group of Miocene to Pleistocene Age. This depositional sequence consists of up to 5,000 ft. of sedimentary and interspersed basaltic lava deposits that accumulated in the Snake River Plain over a basement of thick, older silicic volcanic rocks, primarily rhyolites.

The sedimentary deposits of the Idaho Group were laid down under three distinct episodes of lava damming (and subsequent dam breaking) of the ancestral Snake River. These episodes resulted in the formation of large lakes across the region. Fine-grained (silt and clay) lacustrine (lake bed) deposits are frequently intertongued with coarser-grained (silt and sand) of fluvial (river) and flood plain deposits throughout the area. These discontinuous and interbedded sand, silt, and clay beds form complex stratigraphic relationships on a regional scale. As a general rule, the deposits are unconsolidated except for some minor sandstone and freshwater limestone and localized, discontinuous, basaltic lava beds. Generally, however, the lacustrine deposits predominate and form the most contiguous sedimentary beds across the Snake River Plain and the Site B area. The lacustrine and fluvial sediments of the Glenns Ferry Formation of the Idaho Group are the primary strata of concern at Site B.

The several-hundred-foot-thick Snake River Basalt forms a cap rock over the Idaho Group sediments throughout much of the area and is the youngest formation in the regional sequence. Locally, the Snake River has eroded through the Snake River Basalt and into the underlying Idaho Group sediments. The Idaho Group sediments north of the Snake River, north of Site B, are capped by the resistant Snake River Basalt that forms steep cliffs adjacent to the river. The Idaho Group sediments south of the river (and within the vicinity of Site B) generally lack the protective basalt cap and have been eroded, forming the badlands topography characteristic of the area.

Structure

The Snake River Plain appears to be a downdrop fault-block basin, or graben, bounded by normal faults to the northeast and the southwest. Subsidence in the center of the basin was greatest and, consequently, the Idaho Group sediments are thickest near the center. The regional dips (angle from horizontal that the strata slopes) of the Idaho Group sediments range from near horizontal near the center of the basin to a maximum of about ten (10) degrees toward the margins of the basin. In the vicinity of Site B, regional dips of 2 to 4 degrees have been reported, with strike directions (perpendicular to direction of dip) approximately north 70 degrees west.

As a result of the structural attitude (dip) of the Idaho Group strata, older units tend to be exposed at a considerable distance south of the Snake River, with younger units exposed progressively nearer the river. Faults are apparent throughout the region because of differential settlement of sedimentary beds and movements along the principal regional faults that border the Snake River Plain. Minor faults locally cut older units of the Idaho Group; the younger units, however, are generally unaffected since they were deposited after the faulting occurred. The faults typically parallel the plain; faulting transverse to the plain is not common.

Local Geology

This section focuses on the characteristics of the Idaho Group sediments present in the vicinity of Site B.

Local Stratigraphy

In ascending order (deepest and oldest first), the localized formations are the Poison Creek (600+ feet thick); the Banbury Basalt (200+ feet thick); the Chalk Hills (200+ feet thick); the Glenns Ferry (1,500+ feet thick); and the Bruneau (0 to 100+ feet thick). A detailed stratigraphic column prepared from the driller's log for the artesian well drilled in 1958 at Site B illustrates the stratigraphic sequence at Site B.

The Chalk Hills and Poison Creek Formations represent two individual lacustrine periods affecting the central and western portions, respectively, of the Snake River Plain. In some reports, particularly in many of the older geologic reports concerning the area and on numerous deep-drilling logs, the Poison Creek Formation is shown as occurring stratigraphically above the Banbury Basalt. This is due to lithologic similarities between the Chalk Hills and Poison Creek Formations and the volcanism responsible for the deposition of Banbury Basalt into the lacustrine environments present.

The Glenns Ferry and Bruneau Formations are of prime interest to the site; the Glenns Ferry is the unit where groundwater is first encountered and the Bruneau forms the uppermost geologic unit beneath Site B. Together, these two units form a composite thickness of about 1,600 ft. The deeper Banbury Basalt and Poison Creek Formations are of secondary importance to site-scale hydrogeology only because of their depth. However, these formations provide a regional source of deep-flowing artesian groundwater, generally obtained from depths in excess of 2,000 ft. to 3,000 ft. beneath Site B. The artesian aquifer discussion is provided below. Because of the importance of the Bruneau and Glenns Ferry Formations to the Site B characterization, these units are discussed in detail below.

Glenns Ferry Formation

The Glenns Ferry Formation is of interest since the uppermost zone of saturation beneath Site B exists within the upper portions of this formation. Although the Glenns Ferry Formation is approximately 1,500 ft. thick in the site area, the following discussion focuses on roughly the upper 800 ft. The Glenns Ferry Formation was deposited in the area under three ancestral depositional environments: lacustrine, fluvial, and flood plain. The three stratigraphic facies, each representing a different energy of deposition that is reflected in the typical grain size of the sediments, differ from one another in lithologic composition and areal persistence and tend to grade vertically from one facies to the next. The overall sedimentary pattern in the upper few hundred feet of the Glenns Ferry Formation is of upward coarsening, reflecting the climate and drainage pattern changes that ultimately led to the complete disappearance of the Glenns Ferry lake.

For discussion purposes, the Glenns Ferry Formation has been divided into two units. The lower unit of the Glenns Ferry Formation consists of a lower lacustrine facies that upwardly becomes increasingly interbedded with fine-grained fluvial sands. The upper unit of the Glenns Ferry Formation consists of predominantly fluvial sands grading vertically into flood plain facies. The lacustrine facies is the most extensive and areally persistent sedimentary body in the Glenns Ferry Formation. Because of the structural dip of the beds in the Snake River Plain, all three facies are exposed at the land surface within the general area.

The extensive lacustrine facies consists of a thick-bedded, silty clay to clayey silt that grades with depth into a massive clay. Within the lacustrine facies are discrete intervals of thin lenses of very fine, tuffaceous sand interbedded with thicker, clayey, silt beds. These intervals represent periods of unstable lake margins. As water levels fluctuated, lake margin and fluvial sands were deposited farther into the lake. When the lake levels rose again, the sand lenses were covered with additional fine-grained lacustrine sediments. Where these sand zones are saturated, they represent the water-bearing portions of the lacustrine facies of the Glenns Ferry Formation. The water-bearing zones being monitored at Site B consist of two groups of these thin sand beds sand beds interbedded in the lacustrine sediments. At some exposures, the thick-bedded silt unit is overlain by several feet of very fine sand, alternately interbedded with additional silt. In many exposures, the fine sands are cross-bedded and show the presence of ripple marks. The fine sands generally denote the regional top of the lacustrine facies.

A less extensive fluvial facies overlies the lacustrine deposits, and generally consists of a fine- to medium-grained sand reaching a thickness of about 60 ft. Frequently, a 1" thick, tuffaceous, fine-grained sandstone is found at the top of the fluvial sand. Some cross-bedding is evident in the fluvial facies and, on a local scale, the sand unit intertongues laterally with the lacustrine facies.

The flood plain facies, where present, overlies the fluvial facies and denotes the top of the Glenns Ferry Formation; it consists of an interbedded sequence of clay, silt, and sand. sand beds. Individual beds vary in thickness from about two (2) to four ft. (4') in the general area and laterally persist for several hundred feet. The flood plain sediments are areally discontinuous, however, and range from being absent to about 200 ft. thick. Plant fragments and other detritus are evident in the flood plain facies. Texturally, the flood plain deposits appear banded (that is, possessing thin, laminae-like alternating beds) compared to the more homogeneous underlying fluvial and overlying Bruneau Formation sediments.

Bruneau Formation

The Bruneau Formation consists of a variety of lithologic types ranging from unconsolidated lake deposits that contain basalt flows and tuff beds to high energy river gravels. In the vicinity of Site B, the formation is approximately 100 ft. thick, but the thickness varies greatly and the formation is absent in some locations. The Bruneau Formation is generally more coarse-grained than the underlying Glenns Ferry Formation and has been divided regionally into a basal gravel unit (approximately 40 ft. thick), an overlying lower unit (approximately 70 ft. thick), followed by an upper unit (approximately 20 ft. thick). A 10- to 15-foot tuff layer separates the upper and lower units.

The basal gravel unit is composed of rounded pebbles, cobbles, and coarse-grained, cross-bedded sand lenses. The origin of the unit is interpreted as a river and beach deposits of ancestral Lake Bruneau. The lower unit, which overlies the basal gravel, consists of a thin, basaltic, cinder bed, an intervening mottled clay, and a fine-grained tuffaceous sand. The upper unit of the Bruneau is lithologically similar to the lower unit, but regionally occurs above the 10- to 15-foot-thick tuff layer. Locally, the thicknesses and lithologic characteristics of the Bruneau units can vary considerably. Only the basal gravel unit of the Bruneau Formation is present at USEI Site B.

Minor recent and Pleistocene surficial deposits are also intermittently present in the local area and consist of Snake River terrace gravels, colluvium, and stream alluvium. The stream alluvium exists along the margins of permanent drainages, and the colluvium consists of random slope debris. These minor deposits are difficult to distinguish from the unconsolidated coarse-grained Bruneau Formation deposits on a local scale. For purposes of classification in this report, all surficial deposits in the vicinity of Site B are considered to be part of the Bruneau Formation, even though they may be of more recent geologic origin.

Regional Hydrogeology

The groundwater resources of the area have been examined at the regional scale by several investigators. Mundorff, Crosthwaite, and Kilburn (1964) prepared a report on the occurrence of groundwater within the entire Snake River Plain. Ralston and Chapman (1969) investigated the groundwater resources of northern Owyhee County, and Young and Lewis (1982) examined the hydrology of deep thermal groundwater in southwestern Idaho. Several other groundwater availability and geothermal resource studies have been performed in the region, most notably by

Brott, Blackwell, and Mitchell (1978) and Young, Lewis, and Bracken (1979). On the basis of these principal research studies, an overview of the groundwater resources of the region is presented in the following sections.

Principal Groundwater Systems

The regional studies indicate that three groundwater systems are present in the area of Site B. These systems are as follows:

1. A deep groundwater system found primarily within the silicic volcanics, Banbury Basalt and the Poison Creek Formation. Groundwater is found at depths ranging from 600 to more than 3,000 ft. in this system. Water in this system is under considerable artesian pressure and geothermally heated. Many wells tapping the aquifer are capable of flowing at the land surface. Several flowing geothermal wells in the Castle Creek drainage are used for irrigation and contribute to the general water resources available in that area. In the 3,000-foot-deep water supply well drilled by the U.S. Air Force (USAF) at Site B, the first significant water was encountered at 2,980 ft. The USAF test well flowed at over 300 gpm at a temperature of 170 degrees Fahrenheit. The USAF geothermal well was plugged and abandoned in 1986 by USEI (CH2M HILL, June 1986). The geothermal aquifer system, herein referred to as the deep artesian aquifer, is the most important groundwater resource in the area. Recharge to the deep artesian system in the area is believed to originate in the Owyhee Mountains, where precipitation exceeds 50" annually.
2. A local veneer of saturated alluvium exists along Castle Creek. The alluvium and the creek are reported to be hydraulically connected. Some shallow domestic wells have been installed in the alluvium, generally to depths not exceeding 50 ft. Most of this alluvial system development occurs approximately eight (8) miles southwest and upstream of Site B (Ralston and Chapman, 1969). As Castle Creek flows northeastward from this area to the Snake River, it passes to within one (1) mile of Site B. It can reasonably be assumed that a veneer of saturated alluvium exists along Castle Creek in this downstream area as well. Recharge to this system is primarily by surface water runoff derived locally from precipitation and from the Owyhee Mountains.
3. Groundwater is found within the fine-grained sand beds and interbedded silts of the upper parts of the Glenns Ferry Formation at depths on the order of 140 to 350 ft. below ground level. Well yields and water quality in this system vary greatly. The Glenns Ferry Formation provides water to scattered low-yielding stock watering and domestic wells in the general vicinity of the site. In the area of the town of Oreana, seven (7) miles southwest of Site B, numerous wells provide groundwater for small irrigation and domestic uses from the Glenns Ferry Formation (Ralston and Chapman, 1969). In this area, local leakage from the Catherine Creek alluvial system probably contributes significantly to the recharge and well yields from the Glenns Ferry Formation. Recharge to the shallow Glenns Ferry aquifer comes from direct precipitation on exposed permeable beds, infiltration where the formation is exposed to surface water sources, and by vertical leakage from underlying artesian zones on a broad regional scale. The potential for recharge to the Glenns Ferry Formation from Site B is minimal because all site runoff is directed to lined collection ponds.

The water-bearing intervals being monitored at USEI Site B are in the upper portion of the shallow Glenns Ferry Formation. At Site B, however, the formation is not very permeable and most wells yield less than 0.5 gallon per minute. The shallow Glenns Ferry aquifer as it exists at Site B is not a true aquifer in the context of water resources because of low yield. The detailed characterization of the water-bearing properties and geochemical properties of the shallow Glenns Ferry system beneath Site B is provided in Section E.3.c.

Regional Flow Characteristics

Deep Artesian System

Groundwater in the deep artesian system generally moves from the mountains toward the Snake River, which is the regional hydrologic base level and therefore the likely discharge point for at least a portion of the groundwater in the deep artesian system. The observed northeast direction of flow in this system is consistent with the generalized orientation of the landscape, the trend of regional surface water drainages, and the regional trend of the Owyhee Mountains relative to the position of the Snake River. Strong upward gradients exist between the deep artesian system and shallower systems over most of the area. Where intervening confining strata are thin, more permeable, or breached by faults or wells, the deep artesian system also has a vertical flow pattern and contributes water to shallower systems. This is particularly noted to be occurring in the Castle Creek drainage area southwest of Site B where uncased or uncontrolled artesian wells are contributing to the base flow of Castle Creek and therefore also to the localized alluvial groundwater system in communication with the creek.

Shallow Glenns Ferry Groundwater

Because of the remoteness and sparsely populated nature of the area, coupled with the limited and sporadic groundwater resource potential of the Glenns Ferry Formation, there is insufficient information available to make definitive regional interpretation of flow directions and rates for the Shallow Glenns Ferry system. In general, the shallow groundwater system flows toward, and probably discharges into, the Snake River. However, smaller scale flow directions are expected to be highly variable because of localized points of recharge from surface waters and vertical leakage from the deeper system, and from localized discharge points such as wells and natural drainages. Locally, southeasterly, northeasterly, and easterly flow directions have been identified in the shallow Glenns Ferry groundwater system at Site B. All of these flow directions are generally toward the Snake River where it either discharges directly or enters the local alluvial groundwater system along the Snake River.

Relationship of the Deep Artesian System to Site B

A deep artesian well was drilled on Site B by the USAF in 1958 as a water supply well (Shannon and Wilson, 1959). The artesian well was plugged and abandoned by USEI in 1986 (CH2M HILL, June 1986). The well abandonment was completed methodically and thoroughly using oil-field cementing techniques and cementing service contractors. There have been no data suggesting any vertical leakage from the deep artesian well, either before or after plugging. Although the well was abandoned, because of the location of the artesian well in the center of Site B and because much of the understanding of the deeper geologic formations beneath Site B came from the artesian well records, it is appropriate to preserve the documentation of the well in this application. Pertinent information regarding the deep artesian well is summarized below. In addition, important information on the nature of the deep regional flow system can be gained by a review of the characteristics of this well.

The geologic section beneath Site B is dominated by blue clays and shales. The aquifers of interest at Site B occupy a very small portion of the uppermost geologic formation.

The shut-in pressure of 70 psi at the wellhead reported in 1958 was confirmed in 1986 prior to well abandonment. This value represents a head approximately 160 ft. above the land surface at Site B and approximately 335 ft. above the heads observed in the shallow Glenns Ferry Formation at Site B. These data confirm that a strong upward hydraulic gradient exists between the deep artesian system and the shallow Glenns Ferry system immediately beneath Site B. The drillers log of the artesian well did not report any major aquifer zones between the shallow Glenns Ferry system and the deep artesian zone, spanning an interval of several thousand feet. This was confirmed at the 800-foot-deep exploratory borehole that was drilled by USEI as an exploratory water well west of the site in 1984. Drilling logs from this well indicate that strata below 300 ft. are predominantly blue clay and shale, which is consistent with the drillers log recorded for the artesian well. This hydrogeologic setting and head relationship indicates it is not possible for waste constituents from the site to migrate downward to the deep artesian aquifer. Therefore, the shallow water-bearing zones within the Glenns Ferry Formation are the primary "aquifers" of interest in this Document, and the remainder of this section is devoted to describing, in detail, the characteristics of these two groundwater systems.

Site Hydrogeologic Characteristics

Introduction

In this section, the results of the site-specific hydrogeologic investigations conducted at Site B are presented in detail. The goal of the hydrogeologic investigations to date has been to characterize the geologic and hydrogeologic properties of the uppermost aquifer and any aquifer hydraulically connected to it. At Site B this involved a detailed investigation of the upper 400 ft. of unconsolidated sediments beneath the site. This information has been assembled pursuant to IDAPA 58.01.05.012 (40 CFR 270.14(c)(2)).

The uppermost water-bearing zone beneath Site B actually consists of two discrete, low-yielding, finely bedded sand zones that are separated by a 20- to 30-foot-thick confining clay bed. Under the nomenclature used in this report, these two zones are called the Upper and Lower Aquifers, respectively. Both zones occur in the Glenns Ferry Formation.

An unsaturated zone, ranging from 140 ft. to 200 ft. in thickness, overlies the uppermost aquifer and consists of silts and clays of the Glenns Ferry Formation overlain by coarser-grained sands, silty sands, dense clay beds, and sandy gravels of the Bruneau Formation.

The following sections develop in detail the generalized concepts presented above. A description of the site-specific subsurface geology is provided, followed by a detailed examination of the hydraulic and hydrochemical aspects of the uppermost aquifer system. The system is complex as a result of subtle stratigraphic differences within the Glenns Ferry Formation and the effect of dipping strata. To orient the reader, an overview of the uppermost aquifer concept is presented in Section E.3.c.(3), following the site-specific geology discussion below.

Site Geology

Formation Identification

Quaternary and Tertiary sediments of the Bruneau and Glenns Ferry Formations directly underlie the site. The veneer of surficial gravels present over much of the site is interpreted as basal conglomerate of the Pleistocene-Age Bruneau Formation (Benfer, 1984). Fine-grained sediments of the Pliocene- to Pleistocene-Age Glenns Ferry Formation underlie the Bruneau Formation gravels. The Glenns Ferry then persists throughout the remaining depth of the investigation.

Stratigraphy

Throughout the remainder of this section, references will be made to the observed thicknesses of various geologic strata penetrated. Qualitative descriptive terms have been numerically classified according to Krumbein and Sloss (1963).

Geologic and geophysical logs have been used to construct several geologic cross sections depicting the stratigraphy at USEI Site B. Previous reports and submittals on file with DEQ contain these large cross section plates which are not reproduced in this application.

With two minor exceptions, the basal gravels of the Bruneau overlie the entire site. The exceptions are where the basal gravels are thinly covered by recent soil or ash layers, or where they have been removed by site construction activities. Typically, the gravels are present only to about 50 ft. bgs but were found to extend to approximately 100 ft. in the southeast and northeast corners of the site.

The Glenns Ferry is present beneath the Bruneau gravels and represents sedimentary deposition in a large lake system with peripheral and capping fluvial and flood plain facies (Smith et al., 1982). As such, the Glenns Ferry consists of lake-margin deposits containing fluvial deposits (stream and beach shoreline sands and near-shore silts). Underlying the fluvial deposits are the lacustrine facies (lake deposits) of the Glenns Ferry. The entire sequence exhibits upward coarsening (finer grained with depth). As such, this represents a period of lake regression (a lowering of the water level in the ancient lake [Selley, 1972]). Lithologic and facies contacts are gradual and are controlled by the predominance of grain size and bedding.

The upper (fluvial) sequence of the Glenns Ferry Formation contains very thick-bedded (greater than ten (10) ft.) fine sands and silts containing a few clay seams. Typically, the sands are well sorted, moderately indurated, and thickly bedded. Calcite cementing predominates. The clay seams distributed within the sand are generally thin-bedded (several inches to one (1) ft. thick) and are plastic (soft and moldable). Near the base of the sequence, thin-bedded carbonates (limestone) occur. These sedimentary sequences are representative of lake margin environments (Selley, 1972). This section persists to approximately 130 ft. in depth at the center of the site, where the finer grain size and thinner bedding exists. Where the predominance of finer grain size and thinner bedding exists, this facies change is interpreted as the bottom contact of the fluvial facies overlying lacustrine sediments of the Glenns Ferry Formation.

The lacustrine facies consists of thick-bedded clays and silts containing very thin beds of silt, sand (generally less than one ft. (1) thick), and sand-silt lamina. The sequence expresses cyclic sedimentation for the depth investigated. The formation transcends through thick-bedded sequences of clay and silts containing discrete, thinly bedded sands (one ft. (1) thick or less) and reflects deposition representative of a lacustrine environment as the lake waters rose and fell. The sands and silts (linear and lense-like in form) represent near-shore and shoreline deposits. Portions of this sequence are deltaic in nature and contain abundant plant debris. Sheet-like clay and finer silts are representative of offshore and deeper lacustrine deposition.

The first sequence of shoreline and near-shore deposits underlying the fluvial facies occurs at an approximate depth of 160 ft. at the center of the site. In the northwest portion of the site, the sequence contains numerous thin-bedded silty sands and lamina that are separated by thin- to thick-bedded silts and clays. These sand beds appear to pinch and thin toward the south and east, forming thickly bedded clay and silt in those directions. Although a continuous zone exists, individual sand beds appear discontinuous across the site. This may indicate that the source of the sands was from the northwest, where increased bedding and coarser grain sizes would be expected. This may also be a result of a lateral facies change, such as a transition to a flood plain or deltaic sequence, occurring within the northern portion of the site, or may represent younger deposition upon paleo-erosional surfaces. It is this zone of thin, discontinuous, and laterally variable sands and silts that represents the Upper Aquifer. Within the upper portion of the sequence, the unit changes color from brown to gray, which may represent a change from oxidizing to reducing conditions at the time of deposition.

These near-shore deposits transcend downward into offshore (deep lake) deposits consisting of thickly bedded clay containing silt. This clay unit is approximately 20 ft. thick at the center of the site, extending to a depth of approximately 230 ft. This zone thickens from approximately 20 ft.

thick in the northwest portion of the site to more than 30 ft. thick in the southeast portion of the site. This unit is the confining bed separating the Upper and Lower Aquifers.

This offshore deposit transcends into another shoreline and near-shore sequence, generally comprising thick-bedded silt and thin-bedded clay that contains thin-bedded sands and sand lamina. This zone (the Lower Aquifer) is continuous across the site, although individual sand beds gradually thin and pinch out. This unit extends to a depth of approximately 250 ft., where again, deposition transcends into deeper offshore deposits of thick-bedded clay and fine silt, which provide the basal confinement of the Lower Aquifer. It appears from the limited information and from the deep borings that this facies again transcends into another sequence of near-shore sands and silts at approximately 290 ft. in depth. These sands are very thin-bedded and have not been investigated.

The drilling logs of the deep artesian well onsite and the 800-foot-deep exploratory water well (WWI) west of the site indicate that the strata below 300 ft. are predominantly blue clay and shale to at least 1,770 ft.

Structure

Units of the Glenns Ferry Formation at the site strike north 69 degrees west, and dip approximately 3.5 degrees to the northeast. Gradual differences have been noted within the formation and reflect changes in depositional environment reflective of lacustrine sedimentation and Snake River Plain downwarping. The upper near-shore sequence (i.e., the Upper Aquifer measured at its base) strikes north 70 degrees west and dips 1.8 degrees northeast. The next near-shore sequence (i.e., the Lower Aquifer measured at its center) strikes north 70 degrees west and dips 2.4 degrees northeast, as measured from Coreholes D-32, D-22, and D-21.

No evidence of faulting exists within the depths of the investigation at the site as determined by surface mapping of existing trenches and analysis of geologic cores. Units can be traced across the site using geophysical logs and direct core logs, all of which conform to measured strike and dips. No indications of faulting (such as displacement, associated fracturing, or alteration) have been witnessed throughout the entire geologic section investigated.

Site Hydrostratigraphy

This section will describe in detail the hydrologic and hydrochemical properties of two interbedded sand zones that have been defined as uppermost aquifer(s) beneath the site pursuant to IDAPA 58.01.05.012 (40 CFR 270.14(c)(2)).

Overview

Two low-yielding, water-bearing zones denoted as the Upper and Lower Aquifers have been identified within the shallow Glenns Ferry Formation beneath Site B. Although neither zone would be classified as an aquifer for water resources development because of the definition of the uppermost aquifer in the regulatory context, they represent the uppermost aquifer(s) of concern for groundwater monitoring purposes. The Upper Aquifer at Site B consists of finely bedded, fine, silty sand in 80 ft. to 90 ft. of silt and clay. The top of the Upper Aquifer sequence is a gradational contact with the overlying fluvial facies of the Glenns Ferry Formation. The top of the Upper Aquifer section is 120 to 160 ft. below ground level. A massive clay, 20’ to 30 ft. thick, hydraulically separates the Upper Aquifer from another group of fine, silty, and clayey sands referred to as the Lower Aquifer. The top of the Lower Aquifer is 220 ft. to 275 ft. below ground level and the aquifer section is 30 ft. to 40 ft. thick. Because of structural dip, both aquifers slope to the northeast at approximately 2 to 4 degrees.

As a result of the northeasterly structural dip, the Upper Aquifer sands gradually emerge out of the water from north to south across the site. The entire Upper Aquifer becomes unsaturated along a general east-west trend that crosses the south-central portion of the site. South of this emergence, the sands comprising the Upper Aquifer are present but they are above the potentiometric surface and are not saturated. Conversely, the saturated thickness of the Upper Aquifer increases from south to north as more sands become saturated.

The potentiometric surface of the Upper Aquifer varies from 140 ft. to about 200 ft. below ground level. Groundwater in the Upper Aquifer flows into the site all along the northern border, but most enters from the northwest corner. Flow in the Upper Aquifer is to the east and southeast. The permeabilities of the Upper Aquifer are low, and sustained well yields are generally less than 1.0 gpm.

The Lower Aquifer consists of two (2') ft. to nine (9') ft. of thinly bedded, very fine sand and silty sand seams in a 30- to 40-foot-thick section of silts and clays. Most sand beds are found within a 15-foot-thick interval. The Lower Aquifer is saturated beneath the entire site. The permeabilities of the Lower Aquifer are low, and well yields are generally less than 0.5 gpm. Water in the Lower Aquifer is under moderate artesian pressure. Along the northern edge of the site, water levels rise 60 ft. to 80 ft. above the top of the aquifer. Groundwater in the Lower Aquifer flows to the northeast.

Upper Aquifer

The Upper Aquifer sequence consists of thinly bedded sands and sand lamina separated by thin- to thick-bedded silts and clays. The individual sand seams range from less than 1.5 ft. thick to partings less than 1/16 of an inch thick. Most are between 0.5ft. and 0.1 ft. thick and consist of very fine-grained, silty sand. Lateral continuity of individual sands is difficult to demonstrate, but the aquifer sequence is present across the entire site. The total cumulative thickness of the sand beds changes laterally east and west because of depositional variations.

In the northwest portion of the site, the cumulative thickness of saturated sand beds in the Upper Aquifer ranges from about eight ft. (8) ft. to 36 ft., occurring over approximately 70 ft. of fine- to thick-bedded silts and clays. The individual sand beds thin and pinch-out toward the east and south. Therefore, the Upper Aquifer contains less sands and therefore does not yield as much water to the east and south. The cumulative thickness of bedded sands underlying the water table in the eastern portion of the site is approximately two (2') ft. to 12 ft., occurring over approximately 20 ft. to 50 ft. of fine- to thick-bedded silts and clays.

The bottom of the aquifer sequence is represented by a relatively rapid gradational change from bedded silts and silty clay to the massive silty clay and clay of the underlying confining bed. The bottom of the Upper Aquifer section ranges from 185 ft. to 250 ft. below ground level.

The top of the Upper Aquifer is also a gradational contact. As discussed earlier, the Upper Aquifer is developed in the lacustrine facies of the Glenns Ferry Formation. The contact between the lacustrine and overlying fluvial sediments is a gradational facies change represented by a thinning of beds and dominance of silts and clays from fluvial to lacustrine. The top of the lacustrine facies (top of the Upper Aquifer sequence) ranges from 120 ft. below ground level in the northwest corner to about 160 ft. below ground level in the northeast corner; across the central portion and eastern sides it is 120 ft. to 140 ft. below ground level. Thickness of the sequence ranges from 80 ft. to 90 ft.

The top of the saturated water-bearing portion of the Upper Aquifer is a function of the intersection of the dipping stratigraphic sequence and the potentiometric surface. Because of the dip, the section rises above the potentiometric surface and becomes unsaturated across the southern portion of the site. From south to north, the dip causes progressively more sand seams to intercept the potentiometric surface and become saturated. Consequently, the saturated thickness of the aquifer increases to the north and the top of saturation is found progressively higher in the geologic section comprising the Upper Aquifer.

Each individual saturated sand seam is probably under confined conditions as a result of the adjacent silt and clay beds. Given the scale of the bedding, it is impossible to isolate individual sand seams to verify this assumption. Taken as a whole, however, there appears to be little evidence of vertical gradient within the Upper Aquifer section, and, therefore, the aquifer is considered to be unconfined.

Intermediate Clay Bed

The inner confining clay between the Upper and Lower Aquifers ranges from 20 ft. to 30 ft. thick across the site. As discussed in the previous section, the top of the inner confining clay is gradational with the silts of the bottom of the Upper Aquifer. A similar transitional contact exists between the bottom of the confining clay and the top of the Lower Aquifer. In both cases, the gradational contact occurs within about five ft. (5). This clay consists of blue-gray, massive to thickly bedded clay. In Corehole D-23, in the northwest corner, there are seven (7) to ten (10) silty sand lamina (less than 1/8" thick) within the 20 ft. thick clay, while along the east side, no sand lamina are found in the entire 20 ft. thick section.

This clay unit is persistent and consistent across the site and hydraulically separates the Upper and Lower Aquifers. This hydraulic separation is evidenced by differences in water level, flow directions, and water chemistry between the Upper and Lower Aquifers. These indicators of hydraulic separation are discussed in more detail in subsequent sections.

Lower Aquifer

The Lower Aquifer is a sand sequence within silts and clays of the Glenns Ferry Formation. Although the persistence and thickness of individual thinly bedded sands varies laterally, the aquifer is present and saturated everywhere beneath the site.

The bedded sands occur within a 30 ft. to 40 ft. thick sequence of thick-bedded silts and clays. The majority of sands occur within a 10 ft. to 15 ft. interval. Coreholes and geophysical logs of borings indicate that the bedded sands pinch and thin toward the west and south, forming very thin-bedded sands and sand lamina less than ¼" thick. Some sands are discontinuous and pinch out. The total cumulative thickness of bedded sands in the western portion of the site is less than four (4) ft.

Along the east side of the site, the individual beds range from sand lamina (less than ¼ inch thick) to one ft. (1) thick bedded sands, the latter consisting of fine- to very fine-grained silty sand. Most of the water is probably being carried in the upper portion of the sequence, where greater sand thickness and persistence exist. The total cumulative thickness of bedded sands in the Lower Aquifer along the eastern side is less than nine fi. (9) The top of the Lower Aquifer section is 205 ft to 275 ft. below ground level, and the bottom is 305 ft. to 250 ft. below ground level. The Lower Aquifer section generally ranges from 30 ft. to 40 ft. thick.

Basal Confining Clay

Underlying the Lower Aquifer is a massive to thickly bedded clay at least 25 ft. thick. This clay was penetrated in only a few borings, and it has not been tested extensively. Visual descriptions indicate it to be massive (does not contain sand lamina) and "fat," having high plasticity. Properties of this clay are expected to be similar to the inner confining clay.

Hydraulic Properties

Introduction

Pursuant to IDAPA 58.01.05.012 (40 CFR 270.14(c)(2)), the hydrogeologic regime at USEI Site B was characterized as part of the initial permit application process (CH2M HILL, February 1986). Subsequent to the issuance of the permit, considerable additional information has been developed on the hydraulic properties of the Upper and Lower Aquifers at Site B. This portion presents a complete reexamination of the hydrologic properties of Site B, using both previously presented information and new information. The objectives of the hydrologic characterization program were to 1) examine the factors that influence the rate and direction of groundwater movement; 2) evaluate overall groundwater availability; 3) evaluate the degree of hydraulic separation of the Upper and Lower Aquifers; and 4) estimate the degree of containment afforded by the clays and other sediments found above, below, and between the aquifers.

Information from the available data were used individually and conjunctively to determine the hydraulic characteristics that define the groundwater flow properties at USEI Site B. The aquifers at Site B consist of finely bedded, fine sand and silt beds in a predominantly silty clay matrix. Because most groundwater flow, and therefore most of the potential contaminant migration, would occur in the sand beds, the ultimate aquifer property being sought from the aquifer test data was the hydraulic conductivity (K) of the sand beds, as opposed to a composite hydraulic conductivity of the entire saturated thickness. Most of the test data available, however, provided either an estimate of the composite K or the transmissivity (T) of the entire saturated thickness of the aquifer.

To estimate the K of the sand beds, the T and/or K values from the aquifer tests were adjusted to reflect only the cumulative thickness of sand beds identified in the wells as estimated from review of the geologic and geophysical logs for each well. Once a K was determined, an estimated groundwater velocity was calculated. Aquifer transmissivities were also used to compare the relative water flux across the site through and between aquifers.

To evaluate the degree of containment afforded by the clays and other sediments found above, below, and between the aquifers, laboratory testing was performed on soils collected from the Upper and Lower Aquifers and the inner and lower confining units. Grain-size analyses and permeability testing were performed on 79 samples of materials from three (3)borings, D-21, D-22, and D-23, at the USEI site. These data were previously reported in CH2M HILL (February 1986) as part of USEI's 1985 Part B permit application.

Results

Usable data are not available on all wells but the large amount of data that was available provides valuable information on both aquifers beneath all portions of the site. Soil hydraulics testing data are presented in CH2M HILL (February 1986).

In Section E.3.b., a transmissivity value was estimated for each pumping and recovery test, slug test, and specific capacity test (Table E-9). Based on the individual tests, an average T value for each well was calculated as shown in Table E-9. The average T value is the average of all aquifer tests performed over the lifespan of the well. Additionally, if an individual test was analyzed by more than one analytical technique and more than one analytical technique provided a valid solution, then all valid solutions are included in the calculation of the average T value.

K values were calculated from the average transmissivity data through the relationship $K = T/b$ where b = the saturated aquifer thickness. Representative thickness values were obtained for 22 of 28 test wells in the Upper Aquifer and 14 of 15 test wells in the Lower Aquifer where successful transmissivity values were obtained. Representative thickness values were determined via an interpretation of subsurface conditions at each respective test site. Information from all geologic and geophysical logs were used to estimate the actual thickness of sandbeds present within each test interval. This was done to adjust the aquifer test results under the premise that most of the aquifer response during the tests occurs from the sandier aquifer zones, and not the adjacent confining zones, a portion of which is generally included in the test interval. This resulted in a conservative reduction in the thickness values and an associated conservative increase in hydraulic conductivities.

As a supplement to the in situ determination of hydraulic conductivity provided by the aquifer tests, hydraulic conductivity values were also calculated from grain-size distribution information by the Hazen Method. Thirteen (13) of the 79 samples had grain-size analysis performed on the most permeable beds in the Upper and Lower Aquifers. Table E-11 summarizes the calculated hydraulic conductivity estimates for these 13 soil samples based on the Hazen Method. The Hazen Method is one of several predictive equations that relate hydraulic conductivity values to the grain-size distribution of representative aquifer materials. The techniques are approximation methods, but generally provide useful estimates of hydraulic conductivity (Freeze and Cherry, 1979). Todd (1980) cautions that the empirical formulas may not give reliable results because of the difficulty of including all possible variables in porous media. Therefore, field and laboratory methods are preferable as a general rule.

The Hazen Method estimates K through the following relationship (Equation E.3-2):

$$K = A\ (d_{10})^2$$

where:

K is the hydraulic conductivity, A is a conversion factor (equal to 1.0 when K is reported in cm/sec and grain size in millimeters [mm]), and d_{10} is the grain-size diameter at which ten (10) percent by weight of the particles are finer.

Upper Aquifer

For the Upper Aquifer, transmissivity values were obtained from 28 test wells. Average T values ranged from a low of 0.1 ft^2/day for U-26 to a high of 51.1 ft^2/day for D-18 (abandoned). The mean transmissivity for the Upper Aquifer is 7.0 ft^2/day, based on an average of the average T values. Figure E-12 denotes the average transmissivity values obtained for each Upper Aquifer test site. Figure E-12 also shows the distribution of T values in the Upper Aquifer. In Figure E-12, T values are grouped into ranges of α 0.1 ft^2/day, 0.1 to 2.0 ft^2/day, 2.0 to 5.0 ft^2/day, and > 5.0 ft^2/day. The highest T values of the Upper Aquifer occur beneath the north/northwest portions of the facility and generally decrease toward the south and east.

To understand the significance of these transmissivity values, they can be compared to minimum values required for a domestic water supply. The U.S. Bureau of Reclamation (USBR) has investigated and published the transmissivity values necessary for water supply development purposes (USBR, 1977). Transmissivity values below one (1) ft^2/day are considered infeasible for domestic well purposes, while transmissivity values between one (1) ft^2/day and 10 ft^2/day are considered poor. Fair well potential can be achieved with transmissivity values between 10 and 100 ft^2/day. Thus, the transmissivity values obtained for the test sites are generally in the infeasible to poor well potential range, with only five (5) average T values of the Upper Aquifer test locations falling in the fair range. As shown in Figure E-12, the five higher-yielding wells are located in the north/northwest portion of the Upper Aquifer.

The calculated hydraulic conductivity values derived from the average T for the Upper Aquifer materials range from a minimum of 4.0 x 10^{-2} ft/day (1.4 x 10^{-5} cm/sec) at U-26 to a maximum of 4.2 ft/day (1.5 x 10^{-3} cm/sec) at UP-7. These values are representative of very fine sands and mixtures of sand, silt, and clay, which are reported to have conductivity values ranging from 10^{-3} cm/sec to 10^{-6} cm/sec (Todd, 1980). Consistent results were observed between the geologic classification of subsurface materials and their calculated conductivity values. From Table E-11 it can be seen that the range of empirically derived hydraulic conductivity values (Hazen Method) in the Upper Aquifer is significantly lower than the range determined with the pump tests. For the Upper Aquifer, empirically derived hydraulic conductivity values ranged from 2.6 x 10^{-2} ft/day (9.0 x 10^{-6} cm/sec) to 0.5 ft/day (1.69 x 10^{-4} cm/sec). The hydraulic conductivity values obtained from the grain-size analyses may include finer-grained materials from the confining zones that are adjacent to the sandier aquifer zones. This could account for the somewhat lower values observed. It is important to note that the hydraulic conductivity values obtained from the grain-size analyses were not used in the computation of groundwater velocities. Rather, they have been included for exemplary purposes and as an additional check on pumping test-derived hydraulic conductivities.

Lower Aquifer

For the Lower Aquifer, transmissivity values were obtained from 15 test wells. Average T values ranged from a low of 0.4 ft^2/day for MW-6 (abandoned) to a high of 3.3 ft^2/day for MW-5 (abandoned). The mean transmissivity for the Lower Aquifer is 1.0 ft^2/day, based on an average of the average T values. T values in the Lower Aquifer are low and do not appear to follow a discernible distribution pattern. Based on the USBR criteria discussed above, the transmissivity values obtained from the Lower Aquifer test sites are in the infeasible to poor well potential range for a domestic water supply.

The calculated hydraulic conductivity of the Lower Upper Aquifer materials range from a minimum of 6.9 x 10^{-2} ft/day (2.4 x 10^{-5} cm/sec) at L-38 to a maximum of 8.3 x 10^{-1} ft/day (2.9 x 10^{-4} cm/sec) at MW-5 (abandoned). Similar to the Upper Aquifer, these values are representative of very fine sands and mixtures of sand, silt, and clay, which are reported to have conductivity values ranging from 10^{-3} cm/sec to 10^{-6} cm/sec.

The range of empirically derived hydraulic conductivity values (Hazen Method) in the Lower Aquifer is lower than the range determined with the pump tests. For the Lower Aquifer, empirically derived hydraulic conductivity values ranged from 2.8 x 10^{-3} ft/day (1.0 x 10^{-6} cm/sec) to 0.6 ft/day (1.96 x 10^{-4} cm/sec). As noted above, the hydraulic conductivity values obtained from the grain-size analyses may include materials from the confining zones that are adjacent to the sandier aquifer zones. This could account for the somewhat lower values observed. It is important to note that the hydraulic conductivity values obtained from the grain-size analyses were not used in the computation of groundwater velocities. Rather, they have been included for exemplary purposes and as an additional check on pumping test-derived hydraulic conductivities.

Intermediate (Inner) and Basal Confining Layers

Soil samples collected from D-21, D-22, and D-23 that represent the inner and basal confining zones are identified in Table E-10. The vertical coefficient of permeability was determined for ten (10) of the confining material samples. The range in vertical permeabilities for the two confining zones was 1.1 x 10^{-4} to 1.4 x 10^{-1} ft/day (4 x 10^{-8} to 5.0 x 10^{-5} cm/sec). The single sample (boring D-22, sample S-31) with the 5.0 x 10^{-5} cm/sec value is probably due to bedding fractures within the clay as noted on the well log (CH2M HILL, February 1986) or may represent a silty or sandy seam in the confining bed. Without including this sample, the vertical conductivity of the confining beds ranges from 5.7 x 10^{-3} ft/day (2 x 10^{-6} cm/sec) to 1.1 x 10^{-4} ft/day (4 x 10^{-8} cm/sec) and the mean value is 2.8 x 10^{-4} ft/day (1 x 10^{-7} cm/sec).

As shown in Table E-10, the moisture content for the soil samples collected from the inner and lower confining zones ranged from 23.0 % to 31.0 % and averaged 28.1 %, and the degree saturation ranged from 89.4 % to 98.7 % and averaged 93.7 %. These data indicate that moisture was present in the confining zones at near-saturated field conditions. According to the field drilling logs, the moisture content within the inner and upper confining zones ranged from dry to moist, supporting the presence of some moisture in the soils in the confining zones. However, the moisture content in soils below 100 ft. may have been affected by water used in rotary drilling.

Groundwater Flow Properties

Water Level and Hydraulic Gradient

Depth to Water Level Measurement Corrections

The results of gyroscopic surveys at piezometers U-26, UP-28, and UP-29 and monitoring well L-28 indicate that UP-28, UP-29, and L-28 significantly deviate from vertical, and U-26 does not significantly deviate from vertical. As a result, the depth to water measurements at UP-28, UP-29, and L-28 have been corrected based on regression analysis.

Based on the corrected depth to water measurements, the water level elevation anomaly indicated on potentiometric surface maps of the Upper Aquifer in the vicinity of UP-28 does not appear to be directly associated with the inclination of the piezometer off of vertical. However, the water level elevation anomaly indicated on potentiometric surface maps of the Lower Aquifer in the vicinity of UP-28 does not appear to be directly associated with the inclination of the piezometer off of vertical.

Potentiometric Data

Groundwater levels at USEI Site B are measured semiannually in the monitoring wells and piezometers included in the permitted Detection and Compliance Monitoring Systems. The period of record for each well varies according to when the individual well was installed. Some of the wells in the groundwater monitoring system were installed as test wells for site characterization prior to USEI receiving the permit. Consequently, they have periods of record extending back to 1984. Most of the active monitoring wells were installed after the Part B permit was issued and, therefore, the effective period of record begins in 1989

The pre-1989 data sets tend to have more scatter than the post-1989 wells for several reasons: 1) insufficient water level re-equilibration time between frequent sampling and testing activities; 2) variable wellhead configurations and therefore various measure points between wells and over time for the same well; and 3) non-standardized equipment. As the new and existing wells were brought into the permitted Detection Monitoring System, wellheads and measuring points were standardized, dedicated water level probes were used and written field procedures and data recording formats were adopted. These measures significantly reduced the data scatter in these records.

Water level data and hydrographs for the pre-1989 period are presented in CH2M HILL (February 1986). Appendix E.6 includes the tabulated data and hydrographs for all 50 wells in the current groundwater monitoring system for the period from April 1989 through April 2001. As discussed in the next section, water levels have been rising at Site B. In 1999 a Rising Groundwater Study was completed (CH2M HILL,1999b). In 2001, as required by DEQ, the rising groundwater was re-evaluated (CH2M Hill 2001). The 2001 re-evaluation report provides updated hydrographs through April 2001. The next scheduled re-evaluation of the rising groundwater at Site B will be completed in Fall 2003. The rising groundwater study is further discussed in the next section.

From April 1989 through the October 1996 sampling event, all water levels were measured with the same water-level probe. Prior to the October 1997 water-level measurements, however, the original probe failed and could not be repaired. Consequently, a new water meter was used for the October 1997 water-level data set. Calibrating the new probe or establishing a measurement offset by collecting comparison water levels from several wells using both probes could not be completed before the old probe failed.

In comparing the October 1996 to October 1997 water levels, many wells exhibited a significant decline in recorded water-level elevations between the two events. Because a correlation could not be established between the two probes, the observed declines in water levels between the successive October water levels are not considered reliable.

Water levels are tabulated after each sampling event and included in the sampling reports contained in the operating record. These reports document the water level data collected between April 2001 and October 2002. The October 2002 water levels are included on Table E-13 and the period of water level record from October 1989 to October 2002 is used in this section to describe the water level trends, potentiometric surfaces, hydraulic gradients, groundwater velocities, and the groundwater flux and water balance for the Upper and Lower Aquifers at Site B.

Water Level Trends

Water levels in the monitoring wells and piezometers at Site B have been generally rising over the period of record. The rate of rise for each well is variable and not consistent between wells or over the period of record for any individual well.

In 1999 a rising groundwater study was completed (CH2M HILL, 1999b). This study examined flow paths, water chemistry and age dating in an effort to determine the source of the rising groundwater. The rising groundwater study determined that the water in the Lower Aquifer water and eastern portions of the Upper Aquifer were of similar ages but that the water in the Upper Aquifer in the extreme northwest corner of the site was much younger. This suggests that the water coming into the site in the Upper Aquifer was being recharged by Castle Creek about one (1) mile to the west. This incoming water is displacing the older water in the Upper Aquifer. The rising hydraulic head in the Upper Aquifer is also affecting the pressure head in the Lower Aquifer, especially where the two aquifers overlap. Because of the potential impacts of rising water levels on groundwater flow rates and directions, monitoring well screen placement and concerns over possible impacts to water quality as the rising groundwater encounters vapors or the missile silos, DEQ requires the rising groundwater trends to be re-evaluated every two years. The first re-evaluation was completed in August 2001 and the next one scheduled for Fall 2003.

The 2001 re-evaluation report used regression analysis to predict future water level elevations based on the assumption that the rising water level trends continue at current rates. In summary, these projections indicate the Upper Aquifer water levels will contact the bottom of the missile silos in 36 to 53 years (year 2039 to 2056), again, assuming past trends continue unchanged into the future. In many wells the hydrographs show an initial steeper trend followed by a distinct flattening trend beginning in about 1993 so these predictions must be used with caution. The re-evaluation report also concluded that rising water would not seriously impact well construction or placement as the groundwater flow directions have not changed.

The maximum change has been an increase of 10.71 ft. in piezometer UP-4 and the minimum rise is 3.35 ft. in piezometer UP-7. In general, water levels in the Upper Aquifer on the east side of the site have risen faster than those on the west side. This has resulted in a gradual decrease in the west-to-east gradients across the site, although groundwater flow paths have not significantly changed. A contour map showing the change in water levels in the Upper Aquifer between October 1989 and October 2002 is provided in Figure E-14.

Water levels in the Lower Aquifer wells have also risen over this same period. The average rise in the Lower Aquifer is 4.7 ft. and the range is from 0.42 ft. in well L-35 to 8.26 ft. in well LP-15. In general the wells with the highest water level change, are overlain by the Upper Aquifer. Since the Lower Aquifer is confined, the water levels in these wells are believed to be responding primarily to the increase in loading from the water level rise in the Upper Aquifer.

Well L-38 in the extreme southwest part of the study area experienced a sudden water level increase of approximately ten ft. (10) in 1993 that is believed to be caused by surface loading of earth materials stockpiled in the vicinity during the excavation of Cell 14. Since 1993, the water level has been gradually declining back to the trend line that existed prior to the "spike." Similar, but smaller, spikes occurred in wells L-35 and LP-14 during this same time. These wells are also near the soil stockpile area. Well L-36, in contrast, experienced a drop of approximately three ft. (3) in the water level during this same time, apparently in response to the decrease in loading as the nearby Cell 14 trench was excavated. Since 1993, the water level in L-36 has been gradually rising back to the trend line that existed before the sudden drop in water levels. Water level changes in the Lower Aquifer have not significantly affected the groundwater flow paths.

Potentiometric Surface

Lower Aquifer.

There has been little change in the direction of groundwater flow over the period between October 1989 and October 2002. Groundwater in the Lower Aquifer moves into the site from the southwest and flows northeasterly across the southern end of the site. The equipotential lines on the figures are equally spaced and trend uniformly northwest-southeast. The consistency of the equipotential lines is also another indication that geologic matrix and hydraulic properties of the Lower Aquifer of the site are uniform across the southern and southwestern portions of the site. This uniform flow field characteristic is consistent with the geologic descriptions and hydraulic property characterization data presented earlier in this section.

The potentiometric surface in the Lower Aquifer changes character radically northeast of Cell 14. Because the piezometers in this area are linearly aligned along the northeastern side of the site (LP-12, LP-13 and LP-15), it is difficult to determine true flow patterns. However, the data suggest that groundwater flow in the Lower Aquifer changes to an easterly direction and that the gradients flatten out in this area.

Geologic coring, hydraulic property testing, and geophysical logging of the Lower Aquifer sediments in this area do not indicate any changes in the geologic framework or hydrogeologic properties that would account for these flow direction changes. The apparent distortion of the consistent northeasterly flow pattern exhibited by the Lower Aquifer to the southwest appears to be coincidental with the southern limit of saturation in the overlying Upper Aquifer. These data indicate the potentiometric head in the Lower Aquifer is influenced by the overlying Upper Aquifer. This influence is believed to be primarily related to hydraulic pressure, as opposed to leakage. The hydraulic communication between the Upper and Lower Aquifer is discussed in more detail below.

Based on the October 2002 potentiometric map, horizontal gradients in the southern part of the Lower Aquifer (that portion not overlain by the Upper Aquifer) range from 0.0110 to 0.0440 ft/ft and average 0.0261. It is not possible to establish a gradient for the Lower Aquifer north of the Cell 14 monitoring wells (where it is overlain by the Upper Aquifer) because of insufficient data points.

Upper Aquifer

Water table maps for the Upper Aquifer for the October 1989 and October 2002 periods are provided in Figures E-16 and E-19. Although, as discussed previously, water levels in the Upper Aquifer wells have risen 3.3 ft. to 10.7 ft. over the 1989 to 2002 time period, the overall pattern of groundwater flow has not changed. Water in the Upper Aquifer flows across the site from northwest to southeast. Water also flows into the site all along the northern boundary. This water flows diagonally across the northeastern corner and exits the site along the eastern boundary.

The additional water level data provided by wells UP-28 and UP-29, installed in 1993 along the west central side of the site, suggests a radical and unexplained gradient change in this area as shown on the October 2002 potentiometric map. The data from these wells indicate that along the west central side of the site, water in the Upper Aquifer is flowing from southwest to northeast, which is almost perpendicular to the predominant flow direction in the Upper Aquifer. However, the groundwater flowing from the area of UP-28 and UP-29 eventually converges upon and joins the rest of the system. Detailed site characterization efforts in this area, including a discussion of the high water levels in wells UP-28 and UP-29, are reported in CH2M HILL (June 1993).

Well UP-28 was drilled into the Lower Aquifer to verify the stratigraphy prior to well construction. Although the Lower part of the borehole was plugged with bentonite grout prior to installing the well, upward leakage of Lower Aquifer water cannot be ruled out. It is unlikely, however, that the high water level at UP-28 represents a mounding effect since the Upper Aquifer sediments should be able to accommodate any minimal leakage past the bentonite seal that could be occurring. There are insignificant chemistry differences between the Lower part of the Upper Aquifer and the Lower Aquifer; therefore, there is not a distinctive chemistry profile that can be used to determine if the high water levels represent leakage up the borehole (see Section E.3.c.(6)). Well UP-29 was not drilled into the Lower Aquifer, yet water levels in this well are also higher than expected. This suggests a natural cause for the elevated heads that cannot be explained by the existing data. At this point, the water levels in well UP-28, and to a lesser extent in UP-29, represent the only deviation in the overall northwest-southeast flow direction in the Upper Aquifer.

The irregular spacing and curved equipotential lines for the Upper Aquifer are an indication of the variable Aquifer hydraulic properties of the Upper Aquifer as described previously in Section E.3.c.(4). There are two hydrologic gradient regimes in the Upper Aquifer, illustrated by the distinct spacing of the equipotential lines in Figure E-19. The western 1/2 of the aquifer displays gradients in the range of 0.0049 to 0.0089 ft/ft. The eastern 1/2 has much steeper gradients that range from 0.0140 to 0.0235 ft/ft. The demarcation between the two gradient regimes appears to extend from slightly west of U-26 on the southern extent of the aquifer to between U-5 and UP-7 on the northern site boundary. The area of low gradients in the north and northwest parts of the site coincides with the areas of high hydraulic conductivity and transmissivity. Aquifer properties and well yields are Lower along the eastern side and southern extent of the aquifer. The pattern of hydraulic gradients illustrated in Figure E-19 mirrors and supports the distribution of aquifer properties.

Groundwater Flux and Velocities

Lower Aquifer

The cluster of sand and silty sand seams comprising the Lower Aquifer occurs over an interval 20 ft. to 40 ft. thick. Recalling that aquifer transmissivity, T, is defined as the hydraulic conductivity times saturated thickness, groundwater flux, or the volume of groundwater moving with time through the Lower Aquifer beneath the southern portion of the site, can be estimated by Q = T x I x width, where T = the average aquifer transmissivity, I = the average horizontal gradient, and width is the width of the aquifer parallel to the equipotential lines. The average T for the Lower Aquifer determined in wells around Cell 14 is 1.0 ft/d (Table E-9). The average gradient for the southern portion of the site using the October 2002 water level data is 0.0261 ft/ft as discussed previously. The cross-sectional width of the aquifer beneath Cell 14 is approximately 2,000 ft.. Based on these variables, there is about 57 cubic feet (ft^3) per day or 20,958 ft^3/year of water moving through the entire width and thickness of the Lower Aquifer. To put this flow rate in perspective, a typical household uses 400 gallons per day or 19,600 ft^3/year. Because the cross-sectional area, hydraulic conductivity, and hydraulic gradient in the Lower Aquifer do not change significantly across the site, flux into the site from the west side and flux leaving the site on the east side are approximately equal.

Most groundwater movement and, therefore, contaminant transport, will occur through the sand seams making up the aquifer. Groundwater velocities for the sand seams can be estimated by Velocity = $(K \times I)/n_e$ where K is the hydraulic conductivity, I is the gradient, and n_e is the effective porosity. Effective porosity is defined as that portion of the total porosity through which flow occurs. Effective porosity is almost impossible to determine because of the difficulty in obtaining undisturbed samples. The average porosity of the fine sands in the Upper and Lower Aquifers at Site B was 0.43. Also, as discussed in the 1986 Section E, researchers have concluded that for groundwater flow through granular media, the total porosity can be used in the velocity calculation with little effect. Therefore, velocity calculations for Site B made since 1986 have used the porosity value of 0.43. The K and porosity of the sand beds, as discussed in the Aquifer Properties section, were used in the velocity calculations. Calculated seepage velocities for the Lower Aquifer range from 2.6 ft. to 11.2 ft. per year and average 5.2 ft. per year. Calculated velocities vary with the K and I at each well.

Upper Aquifer

Flux calculations for the Upper Aquifer are more complicated than for the Lower Aquifer because the Upper Aquifer is unconfined, the gradients across the site are highly variable, and the saturated thickness varies from about 70 ft. along the north facility boundary to zero feet across the northern edge of Cell 14 where the last of the aquifer sediments emerge. Consequently, a wedge-shaped, cross-sectional area was used to compute the flux, and separate fluxes were calculated for the west and east sides.

From this exercise, the estimated flux into the site from the west is about 43,122 cubic feet (ft^3) per year and the flux leaving the east side of the site is 5,193 cubic feet (ft^3) per year. The difference between the two values is a net inflow of 37,929 cubic feet (ft^3) per year that must be accounted for. These issues are presented in the Water Balance section (Section E.3.c.(5)(d)), which follows the Upper Aquifer groundwater velocity discussion.

The same approach and assumptions presented earlier for the Lower Aquifer were also used to estimate velocities in the Upper Aquifer sand beds. Calculated seepage velocities for the Upper Aquifer range from 0.2 ft. per year at well U-2 to 81.6 ft. per year at well UP-7. The average for all Upper Aquifer wells is 8.3 ft. per year.

Calculated velocities vary with the K and I at each well. Table E-9 provides the calculated velocity at each Upper Aquifer well for which a K and I value have been determined. Although the composite hydraulic conductivities on the east side of the site are lower than those for the northwest corner, the gradients are higher. Therefore, there are no large and consistent east-west differences in the calculated groundwater velocities in the Upper Aquifer across the site. However the three wells with the highest velocities (UP-7, UP-5 and U-6) are all located in the northeast corner of the site.

Vertical Gradients and Flux

Separating the two aquifers is the inner confining bed, a strata of clay and silty clay 20 ft. to 40 ft. thick. The hydraulic head relationship between the Upper and Lower Aquifers across the inner confining bed varies across the site. Near the southern limit of saturation in the Upper Aquifer north of Cell 14, the hydraulic head in the Lower Aquifer is higher than the water table in the overlying Upper Aquifer. Across a narrow band in the middle of the site there is no significant head difference between the two aquifers, and across the northern 1/2 of the site water levels in the Upper Aquifer are higher than the head in the Lower Aquifer.

Using the October 2002 water level data, there are five Upper Aquifer-Lower Aquifer well pairs available to quantify the gradient across the inner confining bed. The upward gradient, as measured in two well pairs (U-26/L-33 and UP-26/LP-27) averages 0.0378 ft/ft with .77 ft. to 1.5.

ft. of actual water level difference. There are much greater water level differences between the Upper and Lower Aquifers across the northeast side of the site. Downward gradients in the three well pairs in this area (U-7/LP-13, UP-4/LP-12, and U-12/LP-15) average 0.1231, with actual water level differences ranging from 1.63 ft. at U-12/LP-15 to 6.77 ft. at U-7/LP-13.

Laboratory tests conducted on geologic cores of the inner confining bed and from similar formations within and beneath the Lower Aquifer provided estimates of vertical hydraulic conductivities of $1x10^{-7}$ to $1x10^{-8}$ cm/sec. (CH2M HILL, February 1986). Vertical flow occurs across strata, as opposed to along strata for horizontal flow. Therefore, it is appropriate to assume that in a bedded sedimentary sequence, vertical movement will be controlled by the material having the lowest hydraulic conductivity. To evaluate leakage between the Upper and Lower Aquifers, a vertical conductivity of 10^{-8} cm/sec was used.

Applying Darcy's law and using an average vertical hydraulic conductivity of 10^{-8} cm/sec, the gradients discussed previously, and an upward gradient zone 500 ft. wide by the width of the site (2,000 ft.) results in a flux of 391 cubic feet (ft^3) of water per year moving from the Lower to the Upper Aquifer in the southern part of the site. Doing the same calculation for the area with downward gradients across the northern part of the site indicates a downward flux of 3,822 cubic feet (ft^3) per year moving from the Upper Aquifer to the Lower Aquifer.

Comparing the calculated vertical flux into the Lower Aquifer beneath the northern part of the site to the horizontal flux in the Lower Aquifer south of the area overlain by the Upper Aquifer indicates that about 1/4 as much water is moving vertically into the Lower Aquifer as is coming in horizontally from the southwest. As discussed previously, the horizontal gradients in the Lower Aquifer beneath the northern part of the site appear to flatten and change directions to roughly parallel that in the Upper Aquifer. This gradient change is probably due to a combination of the flux of water coming vertically into the Lower Aquifer and the effect of the hydraulic head imposed by the overlying Upper Aquifer.

There are distinct water chemistry differences between the Upper Aquifer and the Lower Aquifer wells in the northern parts of the site. If leakage from the Upper Aquifer is a significant source of water for the Lower Aquifer as the Darcy flux indicates, then the Lower Aquifer water chemistry beneath the northern part of the site should also reflect the influx of Upper Aquifer water.

In summary, although there are strong downward gradients and therefore by Darcy's law a calculable net flux of water from the Upper Aquifer into the Lower Aquifer, water chemistry data suggest that the actual flow is much less than the calculations indicate.

Water Balance Calculation

To synthesize the elements affecting the movement of water though the Upper Aquifer at USEI Site B, a water balance was prepared. One of the most significant benefits of conducting a water balance analysis is to check the validity of the estimated physical and hydrogeologic characteristics of the aquifer and the overall conceptual model of the system. If it is impossible to achieve an approximate level of water balance by applying the site characterization data, then either the characteristics are not correct or the conceptual model is not correct. As will be presented in the following section, the water balance for the Upper Aquifer at Site B indicates that the site characterization data are both correct and reasonable and that the overall conceptual model is correct.

The elements of a water balance for the Upper Aquifer are: lateral inflow, lateral outflow, vertical inflow from the Lower Aquifer, vertical outflow to the Lower Aquifer, infiltration of precipitation, groundwater pumpage, and change in storage. To examine the water balance at Site B, the 13-year period from October 1989 to October 2002 was used. Each of the elements of the water balance discussed independently in the preceding sections is briefly presented below.

Lateral Inflow and Outflow in the Upper Aquifer

As mentioned previously, in the Upper Aquifer there is approximately 43,122 cubic feet (ft^3) per year coming into the site from the northwest and 5,193 cubic feet (ft^3) per year leaving along the eastern side. This results in a net influx of 37,929 cubic feet (ft^3) per year or a total net gain of approximately 498,265 cubic feet (ft^3) over the 1989 to 2002 period.

Vertical Inflow from the Lower Aquifer

The vertical flux calculations provided above account for an influx of 391 cubic feet (ft^3) per year from the Lower Aquifer to the Upper Aquifer over the southern portion of the Upper Aquifer. From 1989 to 2002, this added approximately 5,089 cubic feet (ft^3) of water to the Upper Aquifer.

Vertical Outflow to the Lower Aquifer

Over the northern portion of the Upper Aquifer, the calculated flux from the Upper Aquifer to the Lower Aquifer was about 3,822 cubic feet (ft^3) per year, or 49,683 cubic feet (ft^3) over the 1989-2002 period.

Precipitation Infiltration

There is no direct evidence of the infiltration of precipitation at Site B. In fact, the only hard evidence, very dry moisture contents in the vadose zone determined during the vadose zone characterization, suggests no infiltration is occurring. However, infiltration of precipitation occurs under very arid conditions given the right set of circumstances. Therefore, an infiltration component was included. The percentage of annual precipitation that actually infiltrates and reaches the groundwater is highly speculative and in arid ranges may range from essentially zero to about two percent (2 %) of annual precipitation. An infiltration rate of 0.05 inches per year (0.7 % of annual precipitation) was applied to the total square footage of the Upper Aquifer (about 4,000,000) and equates to about 16,667 cubic feet (ft^3) per year, or 216,967 cubic feet (ft^3) from 1989 to 2002. This calculated amount is intuitively much too large for Site B, especially given the dry vadose sediments present. At Site B where compacted clayey surface soils are prevalent and surface water runoff is channeled into lined ponds, infiltration rates are expected to be very low. The rising groundwater study conducted in 1999 (CH2M HILL, 199b) found no evidence of recent precipitation water in the Upper Aquifer through either water chemistry or tritium age dating and it probable that the effective recharge from precipitation is essentially zero at this site. However, for the purposes of the water balance, a low infiltration rate was used. The conclusions of the water balance evaluation are not affected by the inclusion, or exclusion, of precipitation.

Vadose Zone Drilling and Sampling

Two boreholes, D-33 and D-34, were drilled as part of the vadose zone drilling and sampling program.

Laboratory analyses were performed on 40 vadose zone soil samples from D-33 and D-34. The laboratory data were also grouped by geologic formation to determine the average properties of the different soil types encountered in the two boreholes. A total of seven soil types are identified: the Bruneau Formation soils, Glenns Ferry fluvial facies sand/silty sand soils, Glenns Ferry fluvial facies clayey silt soils, Glenns Ferry sandy silt soils, Glenns Ferry lacustrine sand/silty sand soils, Glenns Ferry lacustrine clayey silt soils, and Glenns Ferry blue-gray clayey silt soils.

Two geologic cross sections of the vadose zone at Site B were prepared from available soil boring logs. Cross section K-K' runs north to south along the eastern edge of the site. Cross section L-L'cuts diagonally across the site from the northeast to the southwest corner. Both cross sections show the interpreted locations of geologic formations and facies beneath the site. It should be noted that these cross sections have a large vertical exaggeration and the actual dip of the various geologic units if drawn to scale would appear almost horizontal.

The following is a summary of the results of the vadose zone drilling and sampling program.

1. Auger drilling and continuous sampling provide effective methods for obtaining detailed stratigraphic information on the vadose zone at Site B to depths of approximately 150 ft.
2. Laboratory data indicate the presence of four distinct soil types: 1) sands and gravels of the Bruneau Formation; 2) sands/silty sands of the fluvial and lacustrine facies of the Glenns Ferry Formation; 3) sandy silts of the fluvial and lacustrine facies of the Glenns Ferry; and 4) clayey silts of the fluvial and lacustrine facies of the Glenns Ferry Formation.
3. Saturated hydraulic conductivities of Bruneau Formation soils show the largest variation and range from 10^{-5} to 10^{-2} cm/sec. Saturated hydraulic conductivities of the Glenns Ferry fluvial and lacustrine sand/silty sand soils are on the order of 10^{-3} cm/sec. Saturated hydraulic conductivities of the Glenns Ferry clayey silt soils are on the order of 10^{-6} cm/sec. Saturated hydraulic conductivities of Glenns Ferry soils at the site differ by three to four orders of magnitude between the sand/silty sand and the clayey silt soils.
4. Cross sections prepared with existing soil boring logs and correlations with grain-size distribution data from Shannon and Wilson indicate that the geologic facies described in D-33 and D-34 are horizontally continuous beneath the site. The ranges of hydraulic conductivity found for soil types in D-33 and D-34 describe the range of hydraulic conductivity for similar soil types at the site.
5. Vadose zone strata dip to the north-northeast between 1.5 and 3.4 degrees. The north-northeast dip direction is consistent with the dip of deeper formations in the area that are known to dip toward the Snake River.
6. The most prominent stratigraphic marker in the vadose zone at Site B is the blue-gray clayey silt layer shown in the cross sections in Figures E-22 and E-23. The change from a light brown to blue-gray color is interpreted as a transition from oxidizing to reducing conditions within the soils. The blue-gray color contact does not parallel the present day potentiometric surface in the uppermost aquifer. Instead, the blue gray contact is located between 11 ft. and 75 ft. above the potentiometric surface and appears to parallel the strata in the vadose zone. This indicates the contact may be due to a change in the depositional environment as, or soon after, the sediments were deposited or is related to a paleo-potentiometric surface in the area.
7. Based on soil boring logs from D-33 and D-34, clayey silt layers comprise 8.6 to 11.0 % (6.5 ft. to 9.4 ft.) of the Glenns Ferry fluvial facies section. Clayey silt layers comprise 67.5 to 75.6 % (28.7 ft. to 36.9 ft.) of the Glenns Ferry lacustrine facies section. The total accumulated thickness of clayey silt layers in D-33 was 43.4 ft. over 155 ft. of borehole. The total thickness of clayey silt layers in D-34 was 38.2 ft. over 153.5 ft.

In situ moisture contents for Site B soils at depths less than 30 ft. are very low and are probably close to the residual value. At these moisture contents, the unsaturated hydraulic conductivity of these soils is also very low, indicating there is a low potential for infiltration and moisture recharge via precipitation at the site.

Computer Modeling

Computer modeling (CH2M HILL, December 1987) was conducted to simulate a release from the bottom of a disposal unit and the movement of a hypothetical leachate plume through the unsaturated zone at Site B. The emphasis was on examining the amount of vertical and lateral movement of leachate through the unsaturated zone. The modeling effort also provided insight into the question of potential leachate plume widths and therefore appropriate monitoring well spacing.

The model SUTRA (Saturated and Unsaturated Transport), developed by the U.S. Geological Survey (Voss, 1984), was used to simulate quasi-3D vertical plume migration in the unsaturated zone. Hydraulic properties of the unsaturated strata underlying Site B used in these simulations were determined in the laboratory on samples collected by continuous coring during the vadose zone drilling and sampling investigation, as described above. The model included 43 separate layers consisting of nine (9) different lithologies based on the cores and vadose zone hydraulic properties analysis.

Simulations were conducted to analyze the effect of both "falling head" (catastrophic release) and "continuous leak for two (2) years" (slow leak based on infiltrating precipitation). The effect on plume spreading of variable leachate source depths and dimensions was also examined. The following represent the relevant conclusions that can be drawn from the simulation results:

1. The results from both simulated scenarios indicate that the unsaturated subsurface beneath Site B acts to completely halt the downward migration of large volumes of source fluid before it can reach the water table. This occurs primarily because the unsaturated zone is thick, relatively dry, and comprised of many low-permeability stratigraphic units that tend to retard and spread out the infiltrating liquids.
2. Simulated dissolved-solute contaminant releases from trenches at Site B, as large as 300,000 gallons and released over a period of two (2) years at a depth of 40 ft., did not reach the water table. A steady-state distribution of concentration for this particular scenario was reached in 15,000 years. At that point in elapsed time, the maximum depth of infiltration was about 130 ft., roughly 50 ft. above the water table.
3. The scale of the leak discussed in item 2 above is the largest leak considered likely to occur through the particular source-area diameter selected (10 ft.). However, should this scale of leak underestimate the size of potential contaminant sources, the results imply that for contamination to reach the water table, and to do so in less than 100 years, it would have to originate from a substantially larger source than the volume of the largest scenario simulated in this investigation.
4. Monitoring well spacing cannot be based solely on the simulation results because the hypothetical plume did not reach the depth of the Upper Aquifer at Site B. Therefore, other criteria must be used to establish appropriate monitoring well spacing and locations. These include location of waste disposal units and aquifer flow rates and flow directions.

Attachment 2

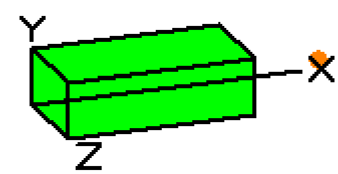
MicroShield 8.03
ACE (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Truck SLC.msd	June 2, 2011	10:45:08 AM	00:00:01

Project Info	
Case Title	Case 2
Description	Case 2
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	457.2 cm (15 ft)
Width	243.84 cm (8 ft)
Height	137.16 cm (4 ft 6.0 in)



Dose Points			
A	X	Y	Z
#1	657.84 cm (21 ft 7.0 in)	68.58 cm (2 ft 3.0 in)	121.92 cm (4 ft)

Shields			
Shield N	Dimension	Material	Density
Source	1.53e+07 cm³	Concrete	1
Shield 1	.64 cm	Iron	7.86
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	μCi/cm³	Bq/cm³
Ac-225	9.9260e-013	3.6726e-002	6.4913e-014	2.4018e-009
Ac-227	5.4485e-006	2.0159e+005	3.5632e-007	1.3184e-002
Am-241	9.0789e-005	3.3592e+006	5.9374e-006	2.1968e-001
At-217	9.9260e-013	3.6726e-002	6.4913e-014	2.4018e-009
Ba-137m	4.2912e-004	1.5878e+007	2.8064e-005	1.0384e+000
Bi-210	5.5405e-004	2.0500e+007	3.6234e-005	1.3406e+000
Bi-211	5.4690e-006	2.0235e+005	3.5766e-007	1.3233e-002
Bi-213	9.9259e-013	3.6726e-002	6.4913e-014	2.4018e-009
Bi-214	9.0846e-004	3.3613e+007	5.9411e-005	2.1982e+000
Co-60	3.6394e-006	1.3466e+005	2.3801e-007	8.8062e-003
Cs-137	4.5362e-004	1.6784e+007	2.9666e-005	1.0976e+000
Fr-221	9.9260e-013	3.6726e-002	6.4913e-014	2.4018e-009
Fr-223	7.5189e-008	2.7820e+003	4.9172e-009	1.8194e-004
H-3	9.0829e-003	3.3607e+008	5.9400e-004	2.1978e+001

Ni-63	1.0895e-003	4.0311e+007	7.1249e-005	2.6362e+000
Np-237	5.4445e-006	2.0145e+005	3.5606e-007	1.3174e-002
Pa-233	5.4445e-006	2.0145e+005	3.5606e-007	1.3174e-002
Pb-209	9.9255e-013	3.6724e-002	6.4911e-014	2.4017e-009
Pb-210	2.5429e-003	9.4088e+007	1.6630e-004	6.1531e+000
Pb-211	5.4690e-006	2.0235e+005	3.5766e-007	1.3233e-002
Pb-214	9.0846e-004	3.3613e+007	5.9411e-005	2.1982e+000
Po-210	5.4792e-004	2.0273e+007	3.5832e-005	1.3258e+000
Po-211	1.4930e-008	5.5242e+002	9.7641e-010	3.6127e-005
Po-213	9.7115e-013	3.5933e-002	6.3511e-014	2.3499e-009
Po-214	9.0827e-004	3.3606e+007	5.9399e-005	2.1978e+000
Po-215	5.4690e-006	2.0235e+005	3.5766e-007	1.3233e-002
Po-218	9.0864e-004	3.3620e+007	5.9423e-005	2.1987e+000
Ra-223	5.4690e-006	2.0235e+005	3.5766e-007	1.3233e-002
Ra-225	9.9523e-013	3.6823e-002	6.5086e-014	2.4082e-009
Ra-226	9.0864e-004	3.3620e+007	5.9423e-005	2.1986e+000
Rn-219	5.4690e-006	2.0235e+005	3.5766e-007	1.3233e-002
Rn-222	9.0864e-004	3.3620e+007	5.9423e-005	2.1987e+000
Sr-90	9.0903e-003	3.3634e+008	5.9448e-004	2.1996e+001
Th-227	5.3860e-006	1.9928e+005	3.5223e-007	1.3032e-002
Th-229	9.9913e-013	3.6968e-002	6.5340e-014	2.4176e-009
Tl-207	5.4541e-006	2.0180e+005	3.5668e-007	1.3197e-002
Tl-209	2.1440e-014	7.9328e-004	1.4021e-015	5.1878e-011
U-233	7.0852e-010	2.6215e+001	4.6335e-011	1.7144e-006
Y-90	9.0926e-003	3.3643e+008	5.9463e-004	2.2001e+001

Buildup: The material reference is Source Integration Parameters	
X Direction	20
Y Direction	20
Z Direction	20

Results					
Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	2.983e+07	2.446e-133	2.449e-27	2.098e-134	2.100e-28
0.02	4.197e+02	2.236e-66	5.422e-32	7.744e-68	1.878e-33
0.03	1.048e+06	6.847e-23	1.388e-22	6.786e-25	1.376e-24
0.04	2.212e+05	5.190e-13	1.677e-12	2.295e-15	7.418e-15
0.05	4.200e+06	9.808e-08	4.602e-07	2.613e-10	1.226e-09
0.06	1.213e+06	2.072e-06	1.225e-05	4.116e-09	2.432e-08
0.08	7.883e+06	5.377e-04	3.569e-03	8.509e-07	5.647e-06
0.1	1.670e+05	5.082e-05	3.232e-04	7.775e-08	4.945e-07
0.15	2.321e+04	3.020e-05	1.594e-04	4.974e-08	2.625e-07
0.2	3.653e+06	8.979e-03	4.153e-02	1.585e-05	7.330e-05

0.3	7.143e+06	3.624e-02	1.404e-01	6.875e-05	2.664e-04
0.4	1.292e+07	1.053e-01	3.601e-01	2.052e-04	7.016e-04
0.5	6.015e+05	7.027e-03	2.186e-02	1.379e-05	4.291e-05
0.6	3.049e+07	4.773e-01	1.372e+00	9.316e-04	2.679e-03
0.8	3.185e+06	7.907e-02	2.025e-01	1.504e-04	3.851e-04
1.0	1.066e+07	3.788e-01	8.922e-01	6.983e-04	1.645e-03
1.5	6.534e+06	4.451e-01	9.120e-01	7.488e-04	1.534e-03
2.0	8.995e+06	9.633e-01	1.823e+00	1.490e-03	2.819e-03
Totals	**1.288e+08**	**2.502e+00**	**5.770e+00**	**4.323e-03**	**1.015e-02**

Attachment 3

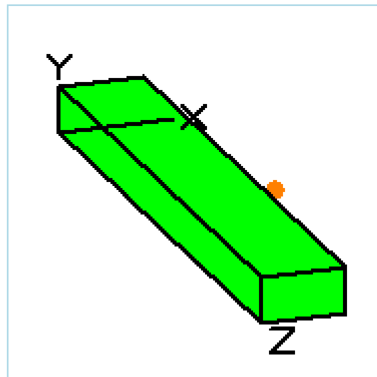
MicroShield 8.03 ACE (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Gondola 1m.msd	June 2, 2011	10:44:11 AM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	274.32 cm (9 ft)
Width	1.8e+3 cm (60 ft)
Height	152.4 cm (5 ft 0.0 in)



Dose Points			
A	X	Y	Z
#1	375.114 cm (12 ft 3.7 in)	76.2 cm (2 ft 6.0 in)	914.4 cm (30 ft)

Shields			
Shield N	Dimension	Material	Density
Source	7.65e+07 cm³	Concrete	1.2
Shield 1	.794 cm	Iron	7.86
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	μCi/cm³	Bq/cm³
Ac-225	4.9672e-012	1.8379e-001	6.4968e-014	2.4038e-009
Ac-227	2.7239e-005	1.0079e+006	3.5628e-007	1.3182e-002
Am-241	4.5402e-004	1.6799e+007	5.9383e-006	2.1972e-001
At-217	4.9672e-012	1.8379e-001	6.4968e-014	2.4038e-009
Ba-137m	2.1474e-003	7.9455e+007	2.8087e-005	1.0392e+000
Bi-210	2.7684e-003	1.0243e+008	3.6210e-005	1.3398e+000
Bi-211	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Bi-213	4.9671e-012	1.8378e-001	6.4968e-014	2.4038e-009
Bi-214	4.5393e-003	1.6795e+008	5.9372e-005	2.1968e+000
Co-60	1.8167e-005	6.7219e+005	2.3762e-007	8.7919e-003
Cs-137	2.2700e-003	8.3991e+007	2.9691e-005	1.0986e+000
Fr-221	4.9672e-012	1.8379e-001	6.4968e-014	2.4038e-009
Fr-223	3.7590e-007	1.3908e+004	4.9166e-009	1.8192e-004
H-3	4.5401e-002	1.6798e+009	5.9382e-004	2.1971e+001

Ni-63	5.4480e-003	2.0158e+008	7.1257e-005	2.6365e+000
Np-237	2.7245e-005	1.0081e+006	3.5636e-007	1.3185e-002
Pa-233	2.7245e-005	1.0081e+006	3.5636e-007	1.3185e-002
Pb-209	4.9669e-012	1.8378e-001	6.4965e-014	2.4037e-009
Pb-210	1.2715e-002	4.7044e+008	1.6630e-004	6.1531e+000
Pb-211	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Pb-214	4.5393e-003	1.6795e+008	5.9372e-005	2.1968e+000
Po-210	2.7378e-003	1.0130e+008	3.5808e-005	1.3249e+000
Po-211	7.4644e-008	2.7618e+003	9.7631e-010	3.6123e-005
Po-213	4.8598e-012	1.7981e-001	6.3564e-014	2.3519e-009
Po-214	4.5383e-003	1.6792e+008	5.9359e-005	2.1963e+000
Po-215	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Po-218	4.5402e-003	1.6799e+008	5.9384e-005	2.1972e+000
Ra-223	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Ra-225	4.9803e-012	1.8427e-001	6.5140e-014	2.4102e-009
Ra-226	4.5402e-003	1.6799e+008	5.9383e-005	2.1972e+000
Rn-219	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Rn-222	4.5402e-003	1.6799e+008	5.9384e-005	2.1972e+000
Sr-90	4.5415e-002	1.6803e+009	5.9400e-004	2.1978e+001
Th-227	2.6927e-005	9.9629e+005	3.5219e-007	1.3031e-002
Th-229	4.9998e-012	1.8499e-001	6.5395e-014	2.4196e-009
Tl-207	2.7267e-005	1.0089e+006	3.5664e-007	1.3196e-002
Tl-209	1.0729e-013	3.9697e-003	1.4033e-015	5.1922e-011
U-233	3.5456e-009	1.3119e+002	4.6374e-011	1.7159e-006
Y-90	4.5426e-002	1.6808e+009	5.9415e-004	2.1984e+001

Buildup: The material reference is Source Integration Parameters	
X Direction	20
Y Direction	20
Z Direction	20

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.491e+08	4.253e-162	1.180e-26	3.648e-163	1.012e-27
0.02	2.098e+03	3.104e-79	2.612e-31	1.075e-80	9.047e-33
0.03	5.243e+06	4.928e-27	1.132e-26	4.884e-29	1.122e-28
0.04	1.107e+06	6.660e-15	2.291e-14	2.945e-17	1.013e-16
0.05	2.100e+07	1.035e-08	5.428e-08	2.756e-11	1.446e-10
0.06	6.067e+06	6.460e-07	4.449e-06	1.283e-09	8.836e-09
0.08	3.939e+07	4.543e-04	3.677e-03	7.189e-07	5.819e-06
0.1	8.350e+05	6.517e-05	5.162e-04	9.971e-08	7.898e-07
0.15	1.161e+05	5.592e-05	3.663e-04	9.209e-08	6.032e-07
0.2	1.825e+07	1.868e-02	1.059e-01	3.296e-05	1.869e-04

0.3	3.569e+07	8.255e-02	3.836e-01	1.566e-04	7.277e-04
0.4	6.456e+07	2.507e-01	1.013e+00	4.884e-04	1.973e-03
0.5	3.005e+06	1.723e-02	6.254e-02	3.383e-05	1.228e-04
0.6	1.525e+08	1.198e+00	3.979e+00	2.339e-03	7.766e-03
0.8	1.591e+07	2.052e-01	5.977e-01	3.904e-04	1.137e-03
1.0	5.326e+07	1.009e+00	2.672e+00	1.860e-03	4.924e-03
1.5	3.265e+07	1.239e+00	2.803e+00	2.085e-03	4.716e-03
2.0	4.495e+07	2.759e+00	5.698e+00	4.266e-03	8.811e-03
Totals	**6.436e+08**	**6.780e+00**	**1.732e+01**	**1.165e-02**	**3.037e-02**

Attachment 4

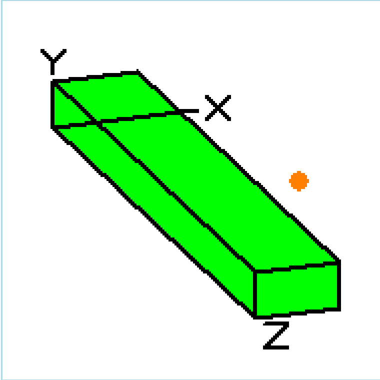
MicroShield 8.03
ACE (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Gondola 2m.msd	June 2, 2011	10:44:40 AM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	274.32 cm (9 ft)
Width	1.8e+3 cm (60 ft)
Height	152.4 cm (5 ft 0.0 in)



Dose Points			
A	X	Y	Z
#1	475.114 cm (15 ft 7.1 in)	76.2 cm (2 ft 6.0 in)	914.4 cm (30 ft)

Shields			
Shield N	Dimension	Material	Density
Source	7.65e+07 cm³	Concrete	1.2
Shield 1	.794 cm	Iron	7.86
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	μCi/cm³	Bq/cm³
Ac-225	4.9672e-012	1.8379e-001	6.4968e-014	2.4038e-009
Ac-227	2.7239e-005	1.0079e+006	3.5628e-007	1.3182e-002
Am-241	4.5402e-004	1.6799e+007	5.9383e-006	2.1972e-001
At-217	4.9672e-012	1.8379e-001	6.4968e-014	2.4038e-009
Ba-137m	2.1474e-003	7.9455e+007	2.8087e-005	1.0392e+000
Bi-210	2.7684e-003	1.0243e+008	3.6210e-005	1.3398e+000
Bi-211	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Bi-213	4.9671e-012	1.8378e-001	6.4968e-014	2.4038e-009
Bi-214	4.5393e-003	1.6795e+008	5.9372e-005	2.1968e+000
Co-60	1.8167e-005	6.7219e+005	2.3762e-007	8.7919e-003
Cs-137	2.2700e-003	8.3991e+007	2.9691e-005	1.0986e+000
Fr-221	4.9672e-012	1.8379e-001	6.4968e-014	2.4038e-009
Fr-223	3.7590e-007	1.3908e+004	4.9166e-009	1.8192e-004
H-3	4.5401e-002	1.6798e+009	5.9382e-004	2.1971e+001

Ni-63	5.4480e-003	2.0158e+008	7.1257e-005	2.6365e+000
Np-237	2.7245e-005	1.0081e+006	3.5636e-007	1.3185e-002
Pa-233	2.7245e-005	1.0081e+006	3.5636e-007	1.3185e-002
Pb-209	4.9669e-012	1.8378e-001	6.4965e-014	2.4037e-009
Pb-210	1.2715e-002	4.7044e+008	1.6630e-004	6.1531e+000
Pb-211	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Pb-214	4.5393e-003	1.6795e+008	5.9372e-005	2.1968e+000
Po-210	2.7378e-003	1.0130e+008	3.5808e-005	1.3249e+000
Po-211	7.4644e-008	2.7618e+003	9.7631e-010	3.6123e-005
Po-213	4.8598e-012	1.7981e-001	6.3564e-014	2.3519e-009
Po-214	4.5383e-003	1.6792e+008	5.9359e-005	2.1963e+000
Po-215	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Po-218	4.5402e-003	1.6799e+008	5.9384e-005	2.1972e+000
Ra-223	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Ra-225	4.9803e-012	1.8427e-001	6.5140e-014	2.4102e-009
Ra-226	4.5402e-003	1.6799e+008	5.9383e-005	2.1972e+000
Rn-219	2.7342e-005	1.0117e+006	3.5762e-007	1.3232e-002
Rn-222	4.5402e-003	1.6799e+008	5.9384e-005	2.1972e+000
Sr-90	4.5415e-002	1.6803e+009	5.9400e-004	2.1978e+001
Th-227	2.6927e-005	9.9629e+005	3.5219e-007	1.3031e-002
Th-229	4.9998e-012	1.8499e-001	6.5395e-014	2.4196e-009
Tl-207	2.7267e-005	1.0089e+006	3.5664e-007	1.3196e-002
Tl-209	1.0729e-013	3.9697e-003	1.4033e-015	5.1922e-011
U-233	3.5456e-009	1.3119e+002	4.6374e-011	1.7159e-006
Y-90	4.5426e-002	1.6808e+009	5.9415e-004	2.1984e+001

Buildup: The material reference is Source Integration Parameters	
X Direction	20
Y Direction	20
Z Direction	20

Results

Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	1.491e+08	1.135e-161	7.251e-27	9.731e-163	6.220e-28
0.02	2.098e+03	3.298e-79	1.606e-31	1.142e-80	5.561e-33
0.03	5.243e+06	3.788e-27	8.474e-27	3.754e-29	8.398e-29
0.04	1.107e+06	5.864e-15	2.019e-14	2.593e-17	8.931e-17
0.05	2.100e+07	8.594e-09	4.477e-08	2.289e-11	1.193e-10
0.06	6.067e+06	4.805e-07	3.256e-06	9.543e-10	6.467e-09
0.08	3.939e+07	2.970e-04	2.353e-03	4.700e-07	3.724e-06
0.1	8.350e+05	4.036e-05	3.130e-04	6.175e-08	4.789e-07
0.15	1.161e+05	3.311e-05	2.137e-04	5.452e-08	3.519e-07
0.2	1.825e+07	1.092e-02	6.121e-02	1.927e-05	1.080e-04

0.3	3.569e+07	4.788e-02	2.208e-01	9.082e-05	4.189e-04
0.4	6.456e+07	1.450e-01	5.824e-01	2.825e-04	1.135e-03
0.5	3.005e+06	9.952e-03	3.596e-02	1.953e-05	7.059e-05
0.6	1.525e+08	6.912e-01	2.288e+00	1.349e-03	4.466e-03
0.8	1.591e+07	1.183e-01	3.439e-01	2.250e-04	6.542e-04
1.0	5.326e+07	5.812e-01	1.538e+00	1.071e-03	2.836e-03
1.5	3.265e+07	7.140e-01	1.617e+00	1.201e-03	2.721e-03
2.0	4.495e+07	1.591e+00	3.295e+00	2.460e-03	5.096e-03
Totals	**6.436e+08**	**3.910e+00**	**9.987e+00**	**6.719e-03**	**1.751e-02**

Attachment 5

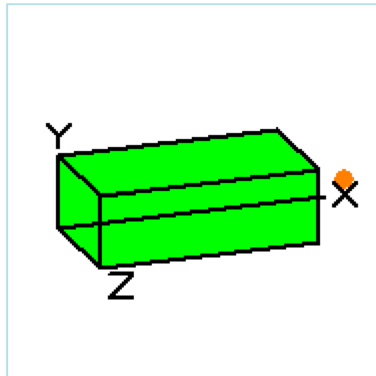
MicroShield 8.03
ACE (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Truck USEI.msd	June 2, 2011	3:14:09 PM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	457.2 cm (15 ft)
Width	243.84 cm (8 ft)
Height	152.4 cm (5 ft 0.0 in)



Dose Points			
A	X	Y	Z
#1	557.84 cm (18 ft 3.6 in)	76.2 cm (2 ft 6.0 in)	121.92 cm (4 ft)

Shields			
Shield N	Dimension	Material	Density
Source	1.70e+07 cm³	Concrete	1.2
Shield 1	.64 cm	Aluminum	2.7
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	μCi/cm³	Bq/cm³
Ac-225	1.1038e-012	4.0841e-002	6.4968e-014	2.4038e-009
Ac-227	6.0532e-006	2.2397e+005	3.5628e-007	1.3182e-002
Am-241	1.0089e-004	3.7330e+006	5.9383e-006	2.1972e-001
At-217	1.1038e-012	4.0841e-002	6.4968e-014	2.4038e-009
Ba-137m	4.7721e-004	1.7657e+007	2.8087e-005	1.0392e+000
Bi-210	6.1521e-004	2.2763e+007	3.6210e-005	1.3398e+000
Bi-211	6.0760e-006	2.2481e+005	3.5762e-007	1.3232e-002
Bi-213	1.1038e-012	4.0841e-002	6.4968e-014	2.4038e-009
Bi-214	1.0087e-003	3.7323e+007	5.9372e-005	2.1968e+000
Co-60	4.0372e-006	1.4938e+005	2.3762e-007	8.7919e-003
Cs-137	5.0445e-004	1.8665e+007	2.9691e-005	1.0986e+000
Fr-221	1.1038e-012	4.0841e-002	6.4968e-014	2.4038e-009
Fr-223	8.3534e-008	3.0908e+003	4.9166e-009	1.8192e-004
H-3	1.0089e-002	3.7329e+008	5.9382e-004	2.1971e+001

Ni-63	1.2107e-003	4.4795e+007	7.1257e-005	2.6365e+000
Np-237	6.0545e-006	2.2402e+005	3.5636e-007	1.3185e-002
Pa-233	6.0545e-006	2.2402e+005	3.5636e-007	1.3185e-002
Pb-209	1.1038e-012	4.0839e-002	6.4965e-014	2.4037e-009
Pb-210	2.8255e-003	1.0454e+008	1.6630e-004	6.1531e+000
Pb-211	6.0760e-006	2.2481e+005	3.5762e-007	1.3232e-002
Pb-214	1.0087e-003	3.7323e+007	5.9372e-005	2.1968e+000
Po-210	6.0839e-004	2.2510e+007	3.5808e-005	1.3249e+000
Po-211	1.6588e-008	6.1374e+002	9.7631e-010	3.6123e-005
Po-213	1.0800e-012	3.9959e-002	6.3564e-014	2.3519e-009
Po-214	1.0085e-003	3.7315e+007	5.9359e-005	2.1963e+000
Po-215	6.0760e-006	2.2481e+005	3.5762e-007	1.3232e-002
Po-218	1.0089e-003	3.7331e+007	5.9384e-005	2.1972e+000
Ra-223	6.0760e-006	2.2481e+005	3.5762e-007	1.3232e-002
Ra-225	1.1067e-012	4.0949e-002	6.5140e-014	2.4102e-009
Ra-226	1.0089e-003	3.7330e+007	5.9383e-005	2.1972e+000
Rn-219	6.0760e-006	2.2481e+005	3.5762e-007	1.3232e-002
Rn-222	1.0089e-003	3.7331e+007	5.9384e-005	2.1972e+000
Sr-90	1.0092e-002	3.7341e+008	5.9400e-004	2.1978e+001
Th-227	5.9838e-006	2.2140e+005	3.5219e-007	1.3031e-002
Th-229	1.1111e-012	4.1110e-002	6.5395e-014	2.4196e-009
Tl-207	6.0594e-006	2.2420e+005	3.5664e-007	1.3196e-002
Tl-209	2.3842e-014	8.8216e-004	1.4033e-015	5.1922e-011
U-233	7.8791e-010	2.9153e+001	4.6374e-011	1.7159e-006
Y-90	1.0095e-002	3.7350e+008	5.9415e-004	2.1984e+001

Buildup: The material reference is Source **Integration Parameters**	
X Direction	20
Y Direction	20
Z Direction	20

Results

Energy (MeV)	**Activity (Photons/sec)**	**Fluence Rate MeV/cm²/sec No Buildup**	**Fluence Rate MeV/cm²/sec With Buildup**	**Exposure Rate mR/hr No Buildup**	**Exposure Rate mR/hr With Buildup**
0.015	3.314e+07	6.763e-16	7.502e-16	5.801e-17	6.434e-17
0.02	4.663e+02	3.484e-13	4.180e-13	1.207e-14	1.448e-14
0.03	1.165e+06	1.329e-05	1.933e-05	1.317e-07	1.916e-07
0.04	2.459e+05	3.899e-05	6.881e-05	1.724e-07	3.043e-07
0.05	4.667e+06	2.272e-03	4.829e-03	6.052e-06	1.286e-05
0.06	1.348e+06	1.246e-03	3.175e-03	2.476e-06	6.307e-06
0.08	8.754e+06	1.692e-02	5.230e-02	2.678e-05	8.276e-05
0.1	1.856e+05	5.550e-04	1.892e-03	8.492e-07	2.894e-06
0.15	2.579e+04	1.485e-04	5.306e-04	2.446e-07	8.738e-07
0.2	4.056e+06	3.573e-02	1.234e-01	6.305e-05	2.178e-04

0.3	7.931e+06	1.257e-01	3.924e-01	2.384e-04	7.444e-04
0.4	1.435e+07	3.455e-01	9.856e-01	6.732e-04	1.920e-03
0.5	6.678e+05	2.231e-02	5.921e-02	4.379e-05	1.162e-04
0.6	3.388e+07	1.481e+00	3.692e+00	2.891e-03	7.206e-03
0.8	3.536e+06	2.373e-01	5.388e-01	4.513e-04	1.025e-03
1.0	1.184e+07	1.111e+00	2.358e+00	2.047e-03	4.347e-03
1.5	7.255e+06	1.258e+00	2.382e+00	2.117e-03	4.008e-03
2.0	9.988e+06	2.670e+00	4.729e+00	4.128e-03	7.313e-03
Totals	**1.430e+08**	**7.307e+00**	**1.532e+01**	**1.269e-02**	**2.700e-02**

Attachment 6

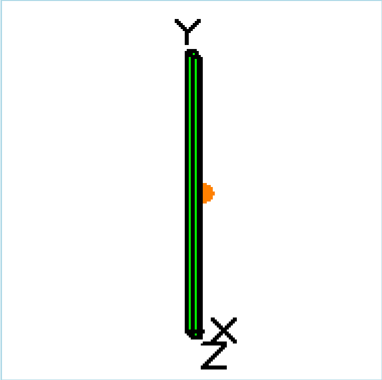
MicroShield 8.03
ACE (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Cell Surface.msd	June 2, 2011	10:43:39 AM	00:00:01

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	13 - Rectangular Volume

Source Dimensions	
Length	100.0 cm (3 ft 3.4 in)
Width	200.0 cm (6 ft 6.7 in)
Height	3.8e+3 cm (125 ft 5.1 in)



Dose Points			
A	X	Y	Z
#1	200.6 cm (6 ft 7.0 in)	1.9e+3 cm (62 ft 8.4 in)	99.974 cm (3 ft 3.4 in)

Shields			
Shield N	Dimension	Material	Density
Source	7.65e+07 cm³	Concrete	1.2
Shield 1	.6 cm	Iron	7.86
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	μCi/cm³	Bq/cm³
Ac-225	4.9673e-012	1.8379e-001	6.4966e-014	2.4038e-009
Ac-227	2.7242e-005	1.0079e+006	3.5629e-007	1.3183e-002
Am-241	4.5403e-004	1.6799e+007	5.9381e-006	2.1971e-001
At-217	4.9673e-012	1.8379e-001	6.4966e-014	2.4038e-009
Ba-137m	2.1475e-003	7.9459e+007	2.8087e-005	1.0392e+000
Bi-210	2.7685e-003	1.0243e+008	3.6208e-005	1.3397e+000
Bi-211	2.7344e-005	1.0117e+006	3.5763e-007	1.3232e-002
Bi-213	4.9673e-012	1.8379e-001	6.4966e-014	2.4037e-009
Bi-214	4.5394e-003	1.6796e+008	5.9370e-005	2.1967e+000
Co-60	1.8161e-005	6.7195e+005	2.3752e-007	8.7883e-003
Cs-137	2.2701e-003	8.3994e+007	2.9690e-005	1.0985e+000
Fr-221	4.9673e-012	1.8379e-001	6.4966e-014	2.4038e-009
Fr-223	3.7593e-007	1.3910e+004	4.9168e-009	1.8192e-004
H-3	4.5403e-002	1.6799e+009	5.9382e-004	2.1971e+001

Ni-63	5.4483e-003	2.0159e+008	7.1257e-005	2.6365e+000
Np-237	2.7246e-005	1.0081e+006	3.5635e-007	1.3185e-002
Pa-233	2.7246e-005	1.0081e+006	3.5635e-007	1.3185e-002
Pb-209	4.9671e-012	1.8378e-001	6.4963e-014	2.4036e-009
Pb-210	1.2715e-002	4.7047e+008	1.6630e-004	6.1531e+000
Pb-211	2.7344e-005	1.0117e+006	3.5763e-007	1.3232e-002
Pb-214	4.5394e-003	1.6796e+008	5.9370e-005	2.1967e+000
Po-210	2.7378e-003	1.0130e+008	3.5807e-005	1.3249e+000
Po-211	7.4650e-008	2.7620e+003	9.7633e-010	3.6124e-005
Po-213	4.8600e-012	1.7982e-001	6.3562e-014	2.3518e-009
Po-214	4.5385e-003	1.6792e+008	5.9357e-005	2.1962e+000
Po-215	2.7344e-005	1.0117e+006	3.5763e-007	1.3232e-002
Po-218	4.5403e-003	1.6799e+008	5.9382e-005	2.1971e+000
Ra-223	2.7344e-005	1.0117e+006	3.5763e-007	1.3232e-002
Ra-225	4.9805e-012	1.8428e-001	6.5139e-014	2.4101e-009
Ra-226	4.5403e-003	1.6799e+008	5.9381e-005	2.1971e+000
Rn-219	2.7344e-005	1.0117e+006	3.5763e-007	1.3232e-002
Rn-222	4.5403e-003	1.6799e+008	5.9382e-005	2.1971e+000
Sr-90	4.5402e-002	1.6799e+009	5.9381e-004	2.1971e+001
Th-227	2.6929e-005	9.9637e+005	3.5220e-007	1.3031e-002
Th-229	5.0000e-012	1.8500e-001	6.5394e-014	2.4196e-009
Tl-207	2.7270e-005	1.0090e+006	3.5665e-007	1.3196e-002
Tl-209	1.0729e-013	3.9698e-003	1.4033e-015	5.1921e-011
U-233	3.5457e-009	1.3119e+002	4.6373e-011	1.7158e-006
Y-90	4.5414e-002	1.6803e+009	5.9396e-004	2.1976e+001

Buildup: The material reference is Source Integration Parameters	
X Direction	20
Y Direction	20
Z Direction	20

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.491e+08	9.902e-125	8.634e-27	8.494e-126	7.405e-28
0.02	2.099e+03	1.354e-62	1.912e-31	4.692e-64	6.622e-33
0.03	5.243e+06	1.002e-21	2.024e-21	9.934e-24	2.006e-23
0.04	1.107e+06	2.062e-12	6.558e-12	9.119e-15	2.900e-14
0.05	2.100e+07	2.654e-07	1.222e-06	7.070e-10	3.254e-09
0.06	6.068e+06	5.015e-06	2.934e-05	9.962e-09	5.827e-08
0.08	3.939e+07	1.349e-03	9.234e-03	2.135e-06	1.461e-05
0.1	8.351e+05	1.389e-04	9.414e-04	2.125e-07	1.440e-06
0.15	1.161e+05	9.269e-05	5.357e-04	1.526e-07	8.822e-07
0.2	1.825e+07	2.883e-02	1.467e-01	5.088e-05	2.590e-04

0.3	3.569e+07	1.211e-01	5.154e-01	2.297e-04	9.777e-04
0.4	6.457e+07	3.593e-01	1.346e+00	7.001e-04	2.622e-03
0.5	3.005e+06	2.434e-02	8.264e-02	4.779e-05	1.622e-04
0.6	1.525e+08	1.675e+00	5.237e+00	3.269e-03	1.022e-02
0.8	1.591e+07	2.826e-01	7.826e-01	5.375e-04	1.489e-03
1.0	5.326e+07	1.374e+00	3.486e+00	2.533e-03	6.425e-03
1.5	3.265e+07	1.660e+00	3.633e+00	2.794e-03	6.112e-03
2.0	4.495e+07	3.662e+00	7.352e+00	5.662e-03	1.137e-02
Totals	**6.437e+08**	**9.189e+00**	**2.259e+01**	**1.583e-02**	**3.966e-02**

Attachment 7

Summary : EGL Vadose Zone Analysis

File : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SAFETY LIGHT_ALTDISPREQUEST_MAY2011.RAD

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
A-1	DCF's for external ground radiation, (mrem/yr)/(pCi/g)			
A-1	Ac-225 (Source: FGR 12)	6.371E-02	6.371E-02	DCF1(1)
A-1	Ac-227 (Source: FGR 12)	4.951E-04	4.951E-04	DCF1(2)
A-1	Am-241 (Source: FGR 12)	4.372E-02	4.372E-02	DCF1(3)
A-1	At-217 (Source: FGR 12)	1.773E-03	1.773E-03	DCF1(4)
A-1	At-218 (Source: FGR 12)	5.847E-03	5.847E-03	DCF1(5)
A-1	Ba-137m (Source: FGR 12)	3.606E+00	3.606E+00	DCF1(6)
A-1	Bi-210 (Source: FGR 12)	3.606E-03	3.606E-03	DCF1(7)
A-1	Bi-211 (Source: FGR 12)	2.559E-01	2.559E-01	DCF1(8)
A-1	Bi-213 (Source: FGR 12)	7.660E-01	7.660E-01	DCF1(9)
A-1	Bi-214 (Source: FGR 12)	9.808E+00	9.808E+00	DCF1(10)
A-1	Co-60 (Source: FGR 12)	1.622E+01	1.622E+01	DCF1(11)
A-1	Cs-137 (Source: FGR 12)	7.510E-04	7.510E-04	DCF1(12)
A-1	Fr-221 (Source: FGR 12)	1.536E-01	1.536E-01	DCF1(13)
A-1	Fr-223 (Source: FGR 12)	1.980E-01	1.980E-01	DCF1(14)
A-1	H-3 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(15)
A-1	Ni-63 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(16)
A-1	Np-237 (Source: FGR 12)	7.790E-02	7.790E-02	DCF1(17)
A-1	Pa-233 (Source: FGR 12)	1.020E+00	1.020E+00	DCF1(18)
A-1	Pb-209 (Source: FGR 12)	7.734E-04	7.734E-04	DCF1(19)
A-1	Pb-210 (Source: FGR 12)	2.447E-03	2.447E-03	DCF1(20)
A-1	Pb-211 (Source: FGR 12)	3.064E-01	3.064E-01	DCF1(21)
A-1	Pb-214 (Source: FGR 12)	1.341E+00	1.341E+00	DCF1(22)
A-1	Po-210 (Source: FGR 12)	5.231E-05	5.231E-05	DCF1(23)
A-1	Po-211 (Source: FGR 12)	4.764E-02	4.764E-02	DCF1(24)
A-1	Po-213 (Source: FGR 12)	0.000E+00	0.000E+00	DCF1(25)
A-1	Po-214 (Source: FGR 12)	5.138E-04	5.138E-04	DCF1(26)
A-1	Po-215 (Source: FGR 12)	1.016E-03	1.016E-03	DCF1(27)
A-1	Po-218 (Source: FGR 12)	5.642E-05	5.642E-05	DCF1(28)
A-1	Ra-223 (Source: FGR 12)	6.034E-01	6.034E-01	DCF1(29)
A-1	Ra-225 (Source: FGR 12)	1.102E-02	1.102E-02	DCF1(30)
A-1	Ra-226 (Source: FGR 12)	3.176E-02	3.176E-02	DCF1(31)
A-1	Rn-219 (Source: FGR 12)	3.083E-01	3.083E-01	DCF1(32)
A-1	Rn-222 (Source: FGR 12)	2.354E-03	2.354E-03	DCF1(33)
A-1	Sr-90 (Source: FGR 12)	7.043E-04	7.043E-04	DCF1(34)
A-1	Th-227 (Source: FGR 12)	5.212E-01	5.212E-01	DCF1(35)
A-1	Th-229 (Source: FGR 12)	3.213E-01	3.213E-01	DCF1(36)
A-1	Tl-207 (Source: FGR 12)	1.980E-02	1.980E-02	DCF1(37)
A-1	Tl-209 (Source: FGR 12)	1.293E+01	1.293E+01	DCF1(38)
A-1	Tl-210 (Source: no data)	0.000E+00	-2.000E+00	DCF1(39)
A-1	U-233 (Source: FGR 12)	1.397E-03	1.397E-03	DCF1(40)
A-1	Y-90 (Source: FGR 12)	2.391E-02	2.391E-02	DCF1(41)
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.724E+00	6.700E+00	DCF2(1)
B-1	Am-241	4.440E-01	4.440E-01	DCF2(2)
B-1	Co-60	2.190E-04	2.190E-04	DCF2(3)
B-1	Cs-137+D	3.190E-05	3.190E-05	DCF2(4)
B-1	H-3	6.400E-08	6.400E-08	DCF2(5)
B-1	Ni-63	6.290E-06	6.290E-06	DCF2(6)

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
B-1	Np-237+D	5.400E-01	5.400E-01	DCF2(7)
B-1	Pb-210+D	2.320E-02	1.360E-02	DCF2(8)
B-1	Ra-226+D	8.594E-03	8.580E-03	DCF2(9)
B-1	Sr-90+D	1.308E-03	1.300E-03	DCF2(10)
B-1	Th-229+D	2.169E+00	2.150E+00	DCF2(11)
B-1	U-233	1.350E-01	1.350E-01	DCF2(12)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.410E-02	DCF3(1)
D-1	Am-241	3.640E-03	3.640E-03	DCF3(2)
D-1	Co-60	2.690E-05	2.690E-05	DCF3(3)
D-1	Cs-137+D	5.000E-05	5.000E-05	DCF3(4)
D-1	H-3	6.400E-08	6.400E-08	DCF3(5)
D-1	Ni-63	5.770E-07	5.770E-07	DCF3(6)
D-1	Np-237+D	4.444E-03	4.440E-03	DCF3(7)
D-1	Pb-210+D	7.276E-03	5.370E-03	DCF3(8)
D-1	Ra-226+D	1.321E-03	1.320E-03	DCF3(9)
D-1	Sr-90+D	1.528E-04	1.420E-04	DCF3(10)
D-1	Th-229+D	4.027E-03	3.530E-03	DCF3(11)
D-1	U-233	2.890E-04	2.890E-04	DCF3(12)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Am-241 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(2,1)
D-34	Am-241 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-05	5.000E-05	RTF(2,2)
D-34	Am-241 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-06	2.000E-06	RTF(2,3)
D-34				
D-34	Co-60 , plant/soil concentration ratio, dimensionless	8.000E-02	8.000E-02	RTF(3,1)
D-34	Co-60 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-02	2.000E-02	RTF(3,2)
D-34	Co-60 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(3,3)
D-34				
D-34	Cs-137+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(4,1)
D-34	Cs-137+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.000E-02	3.000E-02	RTF(4,2)
D-34	Cs-137+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	8.000E-03	8.000E-03	RTF(4,3)
D-34				
D-34	H-3 , plant/soil concentration ratio, dimensionless	4.800E+00	4.800E+00	RTF(5,1)
D-34	H-3 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.200E-02	1.200E-02	RTF(5,2)
D-34	H-3 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-02	1.000E-02	RTF(5,3)
D-34				
D-34	Ni-63 , plant/soil concentration ratio, dimensionless	5.000E-02	5.000E-02	RTF(6,1)
D-34	Ni-63 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(6,2)
D-34	Ni-63 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-02	2.000E-02	RTF(6,3)
D-34				
D-34	Np-237+D , plant/soil concentration ratio, dimensionless	2.000E-02	2.000E-02	RTF(7,1)
D-34	Np-237+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(7,2)
D-34	Np-237+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(7,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(8,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(8,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(8,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(9,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(9,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(9,3)
D-34				
D-34	Sr-90+D , plant/soil concentration ratio, dimensionless	3.000E-01	3.000E-01	RTF(10,1)
D-34	Sr-90+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-03	8.000E-03	RTF(10,2)
D-34	Sr-90+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-03	2.000E-03	RTF(10,3)
D-34				
D-34	Th-229+D , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(11,1)
D-34	Th-229+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(11,2)
D-34	Th-229+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(11,3)
D-34				
D-34	U-233 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(12,1)
D-34	U-233 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(12,2)
D-34	U-233 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(12,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Am-241 , fish	3.000E+01	3.000E+01	BIOFAC(2,1)
D-5	Am-241 , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(2,2)
D-5				
D-5	Co-60 , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Co-60 , crustacea and mollusks	2.000E+02	2.000E+02	BIOFAC(3,2)
D-5				
D-5	Cs-137+D , fish	2.000E+03	2.000E+03	BIOFAC(4,1)
D-5	Cs-137+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(4,2)
D-5				
D-5	H-3 , fish	1.000E+00	1.000E+00	BIOFAC(5,1)
D-5	H-3 , crustacea and mollusks	1.000E+00	1.000E+00	BIOFAC(5,2)
D-5				
D-5	Ni-63 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Ni-63 , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(6,2)
D-5				
D-5	Np-237+D , fish	3.000E+01	3.000E+01	BIOFAC(7,1)
D-5	Np-237+D , crustacea and mollusks	4.000E+02	4.000E+02	BIOFAC(7,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(8,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(8,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(9,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(9,2)
D-5				
D-5	Sr-90+D , fish	6.000E+01	6.000E+01	BIOFAC(10,1)
D-5	Sr-90+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(10,2)

Summary : EGL Vadose Zone Analysis
File   : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SAFETY LIGHT_ALTDISPREQUEST_MAY2011.RAD

Dose Conversion Factor (and Related) Parameter Summary (continued)
Dose Library: FGR 12 & FGR 11

Menu	Parameter	Current Value#	Base Case*	Parameter Name
D-5	Th-229+D , fish	1.000E+02	1.000E+02	BIOFAC(11,1)
D-5	Th-229+D , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(11,2)
D-5				
D-5	U-233 , fish	1.000E+01	1.000E+01	BIOFAC(12,1)
D-5	U-233 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(12,2)

#For DCF1(xxx) only, factors are for infinite depth & area. See ETFG table in Ground Pathway of Detailed Report.
*Base Case means Default.Lib w/o Associate Nuclide contributions.

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	8.822E+04	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.360E+01	2.000E+00	---	THICK0
R011	Fraction of contamination that is submerged	0.000E+00	0.000E+00	---	SUBMFRACT
R011	Length parallel to aquifer flow (m)	5.820E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	2.500E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	0.000E+00	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	1.000E+03	1.000E+03	---	T(8)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(9)
R011	Times for calculations (yr)	not used	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): Ac-227	6.200E-04	0.000E+00	---	S1(1)
R012	Initial principal radionuclide (pCi/g): Am-241	1.030E-02	0.000E+00	---	S1(2)
R012	Initial principal radionuclide (pCi/g): Co-60	4.100E-04	0.000E+00	---	S1(3)
R012	Initial principal radionuclide (pCi/g): Cs-137	5.150E-02	0.000E+00	---	S1(4)
R012	Initial principal radionuclide (pCi/g): H-3	1.030E+00	0.000E+00	---	S1(5)
R012	Initial principal radionuclide (pCi/g): Ni-63	1.240E-01	0.000E+00	---	S1(6)
R012	Initial principal radionuclide (pCi/g): Np-237	6.200E-04	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): Pb-210	2.890E-01	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): Ra-226	1.030E-01	0.000E+00	---	S1(9)
R012	Initial principal radionuclide (pCi/g): Sr-90	1.030E+00	0.000E+00	---	S1(10)
R012	Concentration in groundwater (pCi/L): Ac-227	not used	0.000E+00	---	W1(1)
R012	Concentration in groundwater (pCi/L): Am-241	not used	0.000E+00	---	W1(2)
R012	Concentration in groundwater (pCi/L): Co-60	not used	0.000E+00	---	W1(3)
R012	Concentration in groundwater (pCi/L): Cs-137	not used	0.000E+00	---	W1(4)
R012	Concentration in groundwater (pCi/L): H-3	not used	0.000E+00	---	W1(5)
R012	Concentration in groundwater (pCi/L): Ni-63	not used	0.000E+00	---	W1(6)
R012	Concentration in groundwater (pCi/L): Np-237	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): Pb-210	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): Ra-226	not used	0.000E+00	---	W1(9)
R012	Concentration in groundwater (pCi/L): Sr-90	not used	0.000E+00	---	W1(10)
R013	Cover depth (m)	3.600E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	1.780E+00	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	1.000E-04	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	4.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone field capacity	2.000E-01	2.000E-01	---	FCCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	5.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Average annual wind speed (m/sec)	2.000E+00	2.000E+00	---	WIND
R013	Humidity in air (g/m**3)	8.000E+00	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	7.500E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.840E-01	1.000E+00	---	PRECIP

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R013	Irrigation (m/yr)	2.000E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.500E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	4.300E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	4.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone field capacity	4.000E-01	2.000E-01	---	FCSZ
R014	Saturated zone hydraulic conductivity (m/yr)	2.500E+01	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	1.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.000E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	1.000E-03	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW
R015	Number of unsaturated zone strata	5	1	---	NS
R015	Unsat. zone 1, thickness (m)	1.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.630E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	5.200E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	1.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, field capacity	4.500E-01	2.000E-01	---	FCUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	1.100E+01	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.500E-02	1.000E+01	---	HCUZ(1)
R015	Unsat. zone 2, thickness (m)	4.600E+00	0.000E+00	---	H(2)
R015	Unsat. zone 2, soil density (g/cm**3)	1.690E+00	1.500E+00	---	DENSUZ(2)
R015	Unsat. zone 2, total porosity	3.400E-01	4.000E-01	---	TPUZ(2)
R015	Unsat. zone 2, effective porosity	3.300E-01	2.000E-01	---	EPUZ(2)
R015	Unsat. zone 2, field capacity	7.000E-02	2.000E-01	---	FCUZ(2)
R015	Unsat. zone 2, soil-specific b parameter	2.000E+00	5.300E+00	---	BUZ(2)
R015	Unsat. zone 2, hydraulic conductivity (m/yr)	2.200E+03	1.000E+01	---	HCUZ(2)
R015	Unsat. zone 3, thickness (m)	2.130E+01	0.000E+00	---	H(3)
R015	Unsat. zone 3, soil density (g/cm**3)	1.300E+00	1.500E+00	---	DENSUZ(3)
R015	Unsat. zone 3, total porosity	5.200E-01	4.000E-01	---	TPUZ(3)
R015	Unsat. zone 3, effective porosity	4.000E-01	2.000E-01	---	EPUZ(3)
R015	Unsat. zone 3, field capacity	4.900E-01	2.000E-01	---	FCUZ(3)
R015	Unsat. zone 3, soil-specific b parameter	3.000E+00	5.300E+00	---	BUZ(3)
R015	Unsat. zone 3, hydraulic conductivity (m/yr)	9.000E+02	1.000E+01	---	HCUZ(3)
R015	Unsat. zone 4, thickness (m)	1.680E+01	0.000E+00	---	H(4)
R015	Unsat. zone 4, soil density (g/cm**3)	1.310E+00	1.500E+00	---	DENSUZ(4)
R015	Unsat. zone 4, total porosity	4.900E-01	4.000E-01	---	TPUZ(4)
R015	Unsat. zone 4, effective porosity	4.300E-01	2.000E-01	---	EPUZ(4)
R015	Unsat. zone 4, field capacity	4.800E-01	2.000E-01	---	FCUZ(4)
R015	Unsat. zone 4, soil-specific b parameter	5.000E+00	5.300E+00	---	BUZ(4)
R015	Unsat. zone 4, hydraulic conductivity (m/yr)	6.000E+01	1.000E+01	---	HCUZ(4)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Unsat. zone 5, thickness (m)	1.220E+01	0.000E+00	---	H(5)
R015	Unsat. zone 5, soil density (g/cm**3)	1.500E+00	1.500E+00	---	DENSUZ(5)
R015	Unsat. zone 5, total porosity	5.200E-01	4.000E-01	---	TPUZ(5)
R015	Unsat. zone 5, effective porosity	1.500E-01	2.000E-01	---	EPUZ(5)
R015	Unsat. zone 5, field capacity	3.200E-01	2.000E-01	---	FCUZ(5)
R015	Unsat. zone 5, soil-specific b parameter	8.000E+00	5.300E+00	---	BUZ(5)
R015	Unsat. zone 5, hydraulic conductivity (m/yr)	1.000E-01	1.000E+01	---	HCUZ(5)
R016	Distribution coefficients for Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Unsaturated zone 2 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,2)
R016	Unsaturated zone 3 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,3)
R016	Unsaturated zone 4 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,4)
R016	Unsaturated zone 5 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,5)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.540E-05	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for Am-241				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,1)
R016	Unsaturated zone 2 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,2)
R016	Unsaturated zone 3 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,3)
R016	Unsaturated zone 4 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,4)
R016	Unsaturated zone 5 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(2,5)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	8.540E-05	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for Co-60				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(3,1)
R016	Unsaturated zone 2 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(3,2)
R016	Unsaturated zone 3 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(3,3)
R016	Unsaturated zone 4 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(3,4)
R016	Unsaturated zone 5 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(3,5)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.722E-06	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)
R016	Distribution coefficients for Cs-137				
R016	Contaminated zone (cm**3/g)	2.800E+02	4.600E+03	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+02	4.600E+03	---	DCNUCU(4,1)
R016	Unsaturated zone 2 (cm**3/g)	2.800E+02	4.600E+03	---	DCNUCU(4,2)
R016	Unsaturated zone 3 (cm**3/g)	2.800E+02	4.600E+03	---	DCNUCU(4,3)
R016	Unsaturated zone 4 (cm**3/g)	2.800E+02	4.600E+03	---	DCNUCU(4,4)
R016	Unsaturated zone 5 (cm**3/g)	2.800E+02	4.600E+03	---	DCNUCU(4,5)
R016	Saturated zone (cm**3/g)	2.800E+02	4.600E+03	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.147E-06	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for H-3				
R016	Contaminated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(5,1)
R016	Unsaturated zone 2 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(5,2)
R016	Unsaturated zone 3 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(5,3)
R016	Unsaturated zone 4 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(5,4)
R016	Unsaturated zone 5 (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCU(5,5)
R016	Saturated zone (cm**3/g)	0.000E+00	0.000E+00	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.031E-02	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for Ni-63				
R016	Contaminated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(6,1)
R016	Unsaturated zone 2 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(6,2)
R016	Unsaturated zone 3 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(6,3)
R016	Unsaturated zone 4 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(6,4)
R016	Unsaturated zone 5 (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCU(6,5)
R016	Saturated zone (cm**3/g)	1.000E+03	1.000E+03	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.722E-06	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R016	Distribution coefficients for Np-237				
R016	Contaminated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(7,1)
R016	Unsaturated zone 2 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(7,2)
R016	Unsaturated zone 3 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(7,3)
R016	Unsaturated zone 4 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(7,4)
R016	Unsaturated zone 5 (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCU(7,5)
R016	Saturated zone (cm**3/g)	-1.000E+00	-1.000E+00	2.574E+02	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	6.686E-06	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(8,1)
R016	Unsaturated zone 2 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(8,2)
R016	Unsaturated zone 3 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(8,3)
R016	Unsaturated zone 4 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(8,4)
R016	Unsaturated zone 5 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(8,5)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.719E-05	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(9,1)
R016	Unsaturated zone 2 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(9,2)
R016	Unsaturated zone 3 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(9,3)
R016	Unsaturated zone 4 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(9,4)
R016	Unsaturated zone 5 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(9,5)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.454E-05	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for Sr-90				
R016	Contaminated zone (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCC(10)
R016	Unsaturated zone 1 (cm**3/g)	1.100E+02	3.000E+01	---	DCNUCU(10,1)
R016	Unsaturated zone 2 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(10,2)
R016	Unsaturated zone 3 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(10,3)
R016	Unsaturated zone 4 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(10,4)
R016	Unsaturated zone 5 (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCU(10,5)
R016	Saturated zone (cm**3/g)	1.500E+01	3.000E+01	---	DCNUCS(10)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.135E-04	ALEACH(10)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(10)
R016	Distribution coefficients for daughter Th-229				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(11)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(11,1)
R016	Unsaturated zone 2 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(11,2)
R016	Unsaturated zone 3 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(11,3)
R016	Unsaturated zone 4 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(11,4)
R016	Unsaturated zone 5 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(11,5)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(11)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.870E-08	ALEACH(11)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(11)
R016	Distribution coefficients for daughter U-233				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(12)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(12,1)
R016	Unsaturated zone 2 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(12,2)
R016	Unsaturated zone 3 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(12,3)
R016	Unsaturated zone 4 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(12,4)
R016	Unsaturated zone 5 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(12,5)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(12)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	3.433E-05	ALEACH(12)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(12)
R017	Inhalation rate (m**3/yr)	8.400E+03	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	1.000E-04	1.000E-04	---	MLINH
R017	Exposure duration	3.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	4.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	7.000E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.000E-01	5.000E-01	---	FIND

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fraction of time spent outdoors (on site)	2.500E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	>0 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD_SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD_SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD_SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD_SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD_SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD_SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD_SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD_SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD_SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD_SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD_SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.600E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.400E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	9.200E+01	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	not used	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	not used	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	5.100E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	1.000E+00	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	not used	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.100E+01	FMEAT
R018	Contamination fraction of milk	-1	-1	0.100E+01	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	1.000E+00	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
R19B	Wet weight crop yield for Non-Leafy (kg/m**2)	7.000E-01	7.000E-01	---	YV(1)
R19B	Wet weight crop yield for Leafy (kg/m**2)	1.500E+00	1.500E+00	---	YV(2)
R19B	Wet weight crop yield for Fodder (kg/m**2)	1.100E+00	1.100E+00	---	YV(3)
R19B	Growing Season for Non-Leafy (years)	1.700E-01	1.700E-01	---	TE(1)
R19B	Growing Season for Leafy (years)	2.500E-01	2.500E-01	---	TE(2)
R19B	Growing Season for Fodder (years)	8.000E-02	8.000E-02	---	TE(3)
R19B	Translocation Factor for Non-Leafy	1.000E-01	1.000E-01	---	TIV(1)
R19B	Translocation Factor for Leafy	1.000E+00	1.000E+00	---	TIV(2)
R19B	Translocation Factor for Fodder	1.000E+00	1.000E+00	---	TIV(3)
R19B	Dry Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RDRY(1)
R19B	Dry Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RDRY(2)
R19B	Dry Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RDRY(3)
R19B	Wet Foliar Interception Fraction for Non-Leafy	2.500E-01	2.500E-01	---	RWET(1)
R19B	Wet Foliar Interception Fraction for Leafy	2.500E-01	2.500E-01	---	RWET(2)
R19B	Wet Foliar Interception Fraction for Fodder	2.500E-01	2.500E-01	---	RWET(3)
R19B	Weathering Removal Constant for Vegetation	2.000E+01	2.000E+01	---	WLAM
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR_T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR_T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR_T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR_T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR_T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR_T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR_T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR_T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	1.500E-01	1.500E-01	---	FLOOR1
R021	Bulk density of building foundation (g/cm**3)	2.400E+00	2.400E+00	---	DENSFL

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R021	Total porosity of the cover material	4.130E-01	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	1.000E-01	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	2.650E-02	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	3.000E-02	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	7.233E-07	2.000E-06	---	DIFCV
R021	in foundation material	3.000E-07	3.000E-07	---	DIFFL
R021	in contaminated zone soil	3.000E-07	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	2.000E+00	2.000E+00	---	HMIX
R021	Average building air exchange rate (1/hr)	1.500E+00	5.000E-01	---	REXG
R021	Height of the building (room) (m)	2.500E+00	2.500E+00	---	HRM
R021	Building interior area factor	1.000E+00	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	0.000E+00	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	2.500E-01	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)
TITL	Number of graphical time points	512	---	---	NPTS
TITL	Maximum number of integration points for dose	17	---	---	LYMAX
TITL	Maximum number of integration points for risk	1	---	---	KYMAX

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	suppressed
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	active
Find peak pathway doses	active

Contaminated Zone Dimensions	
Area:	88221.00 square meters
Thickness:	33.60 meters
Cover Depth:	3.60 meters

Initial Soil Concentrations, pCi/g	
Ac-227	6.200E-04
Am-241	1.030E-02
Co-60	4.100E-04
Cs-137	5.150E-02
H-3	1.030E+00
Ni-63	1.240E-01
Np-237	6.200E-04
Pb-210	2.890E-01
Ra-226	1.030E-01
Sr-90	1.030E+00

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 2.500E+01 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
TDOSE(t):	1.997E-03	1.997E-03	1.996E-03	1.992E-03	1.980E-03	1.941E-03	1.832E-03	1.506E-03
M(t):	7.990E-05	7.987E-05	7.983E-05	7.967E-05	7.921E-05	7.763E-05	7.329E-05	6.026E-05

Maximum TDOSE(t): 1.997E-03 mrem/yr   at t = 0.000E+00 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	2.105E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	6.786E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	3.529E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	7.442E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	7.431E-22	0.0000	0.000E+00	0.0000	1.997E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.438E-22	0.0000	0.000E+00	0.0000	1.997E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.105E-31	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.786E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.529E-28	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.442E-31	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.997E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.997E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	2.043E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	5.958E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	3.454E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	7.226E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	7.437E-22	0.0000	0.000E+00	0.0000	1.997E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.443E-22	0.0000	0.000E+00	0.0000	1.997E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.043E-31	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.958E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.454E-28	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.226E-31	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.997E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.997E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.923E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	4.593E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	3.310E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	6.812E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	7.450E-22	0.0000	0.000E+00	0.0000	1.996E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.455E-22	0.0000	0.000E+00	0.0000	1.996E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.923E-31	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.593E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.310E-28	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.812E-31	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.996E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.996E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.556E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.847E-25	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	2.849E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	5.541E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	7.496E-22	0.0000	0.000E+00	0.0000	1.992E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.498E-22	0.0000	0.000E+00	0.0000	1.992E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.556E-31	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.847E-25	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.849E-28	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.541E-31	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.992E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.992E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	8.504E-32	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.369E-26	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	1.856E-28	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	1.982E-33	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	3.072E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	7.629E-22	0.0000	0.000E+00	0.0000	1.980E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	7.629E-22	0.0000	0.000E+00	0.0000	1.980E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.504E-32	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.369E-26	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.856E-28	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.982E-33	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.072E-31	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.980E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.980E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	1.026E-32	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	1.516E-30	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	4.144E-29	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	2.366E-32	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	8.112E-22	0.0000	0.000E+00	0.0000	1.941E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	8.112E-22	0.0000	0.000E+00	0.0000	1.941E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.026E-32	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.516E-30	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.144E-29	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.366E-32	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.941E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.941E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	5.713E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	2.776E-31	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	9.668E-22	0.0000	0.000E+00	0.0000	1.832E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	9.668E-22	0.0000	0.000E+00	0.0000	1.832E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.713E-31	0.0000
H-3	4.396E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.622E-10	0.0000	2.283E-10	0.0000	6.112E-10	0.0000	5.798E-09	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.776E-31	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.832E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	4.396E-09	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	5.622E-10	0.0000	2.283E-10	0.0000	6.112E-10	0.0000	1.832E-03	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	7.972E-30	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	1.787E-21	0.0000	0.000E+00	0.0000	1.506E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	1.787E-21	0.0000	0.000E+00	0.0000	1.506E-03	1.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
Nuclide	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
Ac-227	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Am-241	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Co-60	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Cs-137	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
H-3	2.891E-29	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.696E-30	0.0000	1.501E-30	0.0000	4.019E-30	0.0000	3.812E-29	0.0000
Ni-63	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Np-237	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	7.972E-30	0.0000
Pb-210	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Ra-226	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.506E-03	1.0000
Sr-90	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	2.891E-29	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.696E-30	0.0000	1.501E-30	0.0000	4.019E-30	0.0000	1.506E-03	1.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	3.395E-28	3.294E-28	3.101E-28	2.510E-28	1.372E-28	1.655E-29	3.931E-32	2.568E-41
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	1.330E-40	3.993E-40	9.341E-40	2.827E-39	8.420E-39	3.032E-38	1.176E-37	1.044E-36
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	8.903E-41	1.337E-39	1.562E-38	4.170E-37	1.040E-35	3.976E-34	1.290E-32	9.645E-31
Am-241	∑DSR(j)		2.220E-40	1.736E-39	1.656E-38	4.199E-37	1.040E-35	3.976E-34	1.290E-32	9.645E-31
Co-60	Co-60	1.000E+00	1.655E-21	1.453E-21	1.120E-21	4.506E-22	3.339E-23	3.698E-27	1.846E-38	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	6.853E-27	6.708E-27	6.426E-27	5.531E-27	3.604E-27	8.046E-28	1.109E-29	3.414E-36
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.629E-09	3.701E-29
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	8.212E-34	8.229E-34	8.263E-34	8.385E-34	8.744E-34	1.012E-33	1.539E-33	6.662E-33
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45	4.204E-45	7.847E-44
Np-237+D	Th-229+D	1.000E+00	1.100E-33	7.707E-33	4.085E-32	3.689E-31	3.196E-30	3.816E-29	4.478E-28	1.286E-26
Np-237+D	∑DSR(j)		1.921E-33	8.530E-33	4.167E-32	3.697E-31	3.197E-30	3.817E-29	4.478E-28	1.286E-26
Pb-210+D	Pb-210+D	1.000E+00	2.575E-30	2.500E-30	2.357E-30	1.917E-30	1.063E-30	1.348E-31	3.694E-34	3.980E-43
Ra-226+D	Ra-226+D	1.000E+00	1.939E-02	1.939E-02	1.938E-02	1.934E-02	1.923E-02	1.884E-02	1.779E-02	1.463E-02
Ra-226+D	Pb-210+D	1.000E+00	4.023E-32	1.192E-31	2.706E-31	7.380E-31	1.667E-30	2.837E-30	3.738E-30	8.329E-30
Ra-226+D	∑DSR(j)		1.939E-02	1.939E-02	1.938E-02	1.934E-02	1.923E-02	1.884E-02	1.779E-02	1.463E-02
Sr-90+D	Sr-90+D	1.000E+00	1.865E-35	1.825E-35	1.747E-35	1.500E-35	9.693E-36	2.105E-36	2.681E-38	5.605E-45

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 2.500E+01 mrem/yr

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13	*7.232E+13
Am-241	*3.431E+12	*3.431E+12	*3.431E+12	*3.431E+12	*3.431E+12	*3.431E+12	*3.431E+12	*3.431E+12
Co-60	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15	*1.132E+15
Cs-137	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13	*8.704E+13
H-3	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	*9.597E+15	4.441E+09	*9.597E+15
Ni-63	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13	*5.917E+13
Np-237	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08	*7.047E+08
Pb-210	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13	*7.634E+13
Ra-226	1.289E+03	1.290E+03	1.290E+03	1.293E+03	1.300E+03	1.327E+03	1.405E+03	1.709E+03
Sr-90	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14	*1.365E+14

*At specific activity limit

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 0.000E+00 years

Nuclide (i)	Initial (pCi/g)	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
Ac-227	6.200E-04	0.000E+00	3.395E-28	*7.232E+13	3.395E-28	*7.232E+13
Am-241	1.030E-02	0.000E+00	0.000E+00	*3.431E+12	0.000E+00	*3.431E+12
Co-60	4.100E-04	0.000E+00	1.655E-21	*1.132E+15	1.655E-21	*1.132E+15
Cs-137	5.150E-02	0.000E+00	6.853E-27	*8.704E+13	6.853E-27	*8.704E+13
H-3	1.030E+00	217.1 ± 0.4	4.199E-07	5.954E+07	0.000E+00	*9.597E+15
Ni-63	1.240E-01	0.000E+00	0.000E+00	*5.917E+13	0.000E+00	*5.917E+13
Np-237	6.200E-04	1.000E+03	1.286E-26	*7.047E+08	0.000E+00	*7.047E+08
Pb-210	2.890E-01	0.000E+00	2.575E-30	*7.634E+13	2.575E-30	*7.634E+13
Ra-226	1.030E-01	0.000E+00	1.939E-02	1.289E+03	1.939E-02	1.289E+03
Sr-90	1.030E+00	0.000E+00	0.000E+00	*1.365E+14	0.000E+00	*1.365E+14

*At specific activity limit

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	2.105E-31	2.043E-31	1.923E-31	1.556E-31	8.504E-32	1.026E-32	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-233	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-233	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
U-233	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-229	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-229	Np-237	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.982E-33	2.366E-32	2.776E-31	7.972E-30
Th-229	∑DOSE(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.982E-33	2.366E-32	2.776E-31	7.972E-30
Co-60	Co-60	1.000E+00	6.786E-25	5.958E-25	4.593E-25	1.847E-25	1.369E-26	1.516E-30	0.000E+00	0.000E+00
Cs-137	Cs-137	1.000E+00	3.529E-28	3.454E-28	3.310E-28	2.849E-28	1.856E-28	4.144E-29	5.713E-31	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.798E-09	3.812E-29
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210	Pb-210	1.000E+00	7.442E-31	7.226E-31	6.812E-31	5.541E-31	3.072E-31	0.000E+00	0.000E+00	0.000E+00
Pb-210	Ra-226	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.717E-31	2.922E-31	3.850E-31	8.578E-31
Pb-210	∑DOSE(j)		7.442E-31	7.226E-31	6.812E-31	5.541E-31	4.788E-31	2.922E-31	3.850E-31	8.578E-31
Ra-226	Ra-226	1.000E+00	1.997E-03	1.997E-03	1.996E-03	1.992E-03	1.980E-03	1.941E-03	1.832E-03	1.506E-03
Sr-90	Sr-90	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

THF(i) is the thread fraction of the parent nuclide.

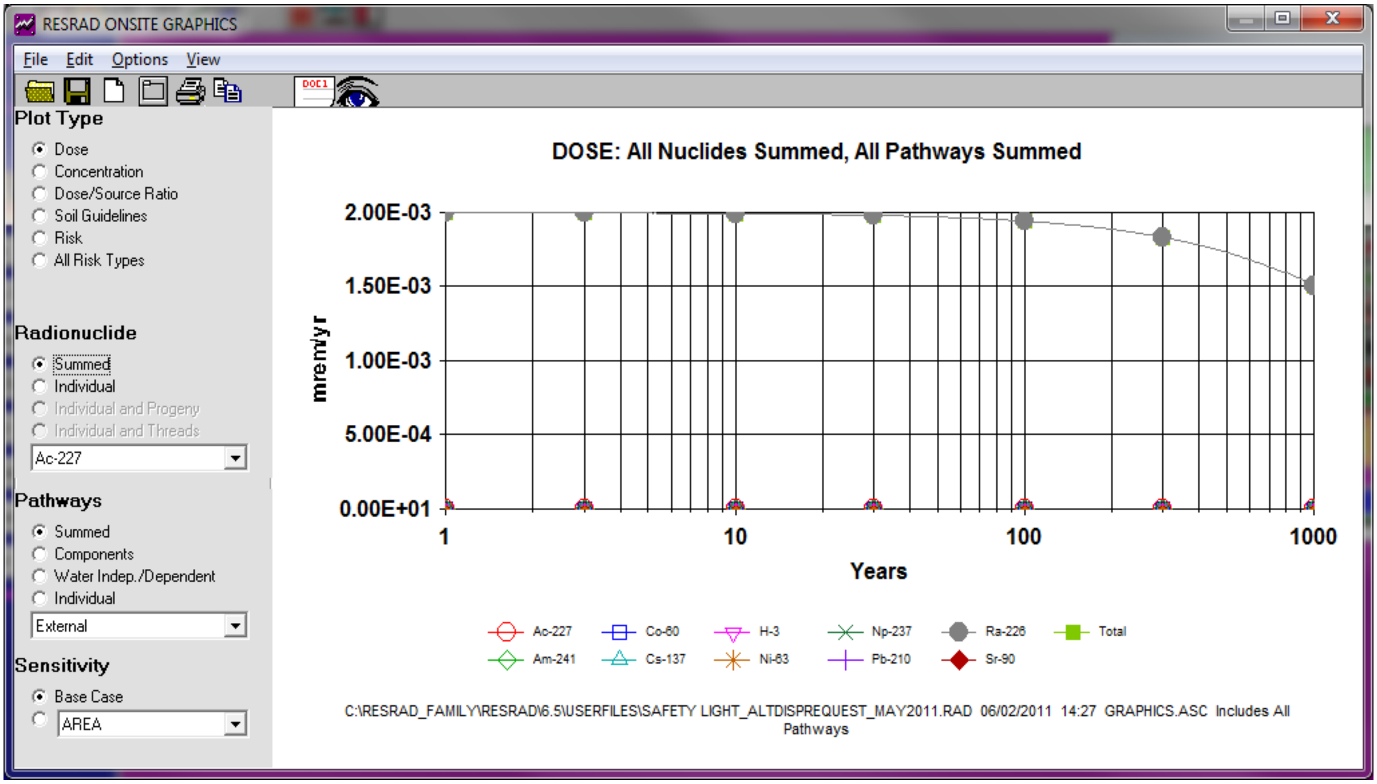
Individual Nuclide Soil Concentration
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	THF(i)	S(j,t), pCi/g t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	Ac-227	1.000E+00	6.200E-04	6.005E-04	5.634E-04	4.506E-04	2.380E-04	2.547E-05	4.300E-08	8.501E-18
Am-241	Am-241	1.000E+00	1.030E-02	1.028E-02	1.025E-02	1.013E-02	9.791E-03	8.699E-03	6.205E-03	1.902E-03
Np-237	Am-241	1.000E+00	0.000E+00	3.333E-09	9.983E-09	3.308E-08	9.758E-08	3.069E-07	7.843E-07	1.603E-06
Np-237	Np-237	1.000E+00	6.200E-04	6.200E-04	6.200E-04	6.200E-04	6.199E-04	6.196E-04	6.187E-04	6.157E-04
Np-237	∑S(j):		6.200E-04	6.200E-04	6.200E-04	6.200E-04	6.200E-04	6.199E-04	6.195E-04	6.173E-04
U-233	Am-241	1.000E+00	0.000E+00	7.291E-15	6.554E-14	7.253E-13	6.453E-12	6.890E-11	5.557E-10	4.393E-09
U-233	Np-237	1.000E+00	0.000E+00	2.711E-09	8.134E-09	2.711E-08	8.129E-08	2.705E-07	8.079E-07	2.650E-06
U-233	∑S(j):		0.000E+00	2.711E-09	8.134E-09	2.711E-08	8.129E-08	2.706E-07	8.084E-07	2.655E-06
Th-229	Am-241	1.000E+00	0.000E+00	2.295E-19	6.191E-18	2.286E-16	6.116E-15	2.195E-13	5.429E-12	1.522E-10
Th-229	Np-237	1.000E+00	0.000E+00	1.280E-13	1.152E-12	1.280E-11	1.151E-10	1.274E-09	1.136E-08	1.222E-07
Th-229	∑S(j):		0.000E+00	1.280E-13	1.152E-12	1.280E-11	1.151E-10	1.274E-09	1.137E-08	1.224E-07
Co-60	Co-60	1.000E+00	4.100E-04	3.595E-04	2.763E-04	1.101E-04	7.933E-06	7.973E-10	3.016E-21	0.000E+00
Cs-137	Cs-137	1.000E+00	5.150E-02	5.032E-02	4.805E-02	4.087E-02	2.575E-02	5.106E-03	5.020E-05	4.729E-12
H-3	H-3	1.000E+00	1.030E+00	9.638E-01	8.439E-01	5.301E-01	1.404E-01	1.342E-03	2.278E-09	1.452E-29
Ni-63	Ni-63	1.000E+00	1.240E-01	1.231E-01	1.213E-01	1.154E-01	9.985E-02	6.022E-02	1.421E-02	9.056E-05
Pb-210	Pb-210	1.000E+00	2.890E-01	2.802E-01	2.633E-01	2.118E-01	1.137E-01	1.289E-02	2.564E-05	9.002E-15
Pb-210	Ra-226	1.000E+00	0.000E+00	3.152E-03	9.164E-03	2.745E-02	6.196E-02	9.515E-02	9.107E-02	6.610E-02
Pb-210	∑S(j):		2.890E-01	2.833E-01	2.724E-01	2.392E-01	1.756E-01	1.080E-01	9.109E-02	6.610E-02
Ra-226	Ra-226	1.000E+00	1.030E-01	1.030E-01	1.029E-01	1.025E-01	1.016E-01	9.839E-02	8.978E-02	6.517E-02
Sr-90	Sr-90	1.000E+00	1.030E+00	1.006E+00	9.587E-01	8.109E-01	5.026E-01	9.422E-02	7.884E-04	4.226E-11

THF(i) is the thread fraction of the parent nuclide.

RESCALC.EXE execution time =   6.24 seconds

Attachment 8



RESRAD ONSITE GRAPHICS
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Dose
Concentration
Dose/Source Ratio
Soil Guidelines
Risk
All Risk Types
Radionuclide
Summed
Individual
Individual and Progeny
Individual and Threads
Ac-227
Pathways
Summed
Components
Water Indep./Dependent
Individual
External
Sensitivity
Base Case
AREA
DOSE: All Nuclides Summed, All Pathways Summed
mrem/yr
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1.50E-03
1.00E-03
5.00E-04
0.00E+01
1
10
100
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Co-60
H-3
Np-237
Ra-226
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Am-241
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Pb-210
Sr-90
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Enclosure B

US Army Corps
of Engineers
Baltimore District

FINAL

TECHNICAL MEMORANDUM

Excess Cancer Morbidity Risk Estimates From Implementation of Alternate Waste Disposal of OU1 Demolition Debris

Safety Light Superfund Site
Bloomsburg, PA

26 March 2012

List of Acronyms and Abbreviations

^{3}H	hydrogen isotope hydrogen-3 (also referred to as tritium)
^{60}Co	cobalt isotope cobalt-60
^{63}Ni	nickel isotope nickel-63
^{90}Sr	strontium isotope strontium-90
^{137}Cs	cesium isotope cesium-137
^{210}Pb	lead isotope lead-210
^{226}Ra	radium isotope radium-226
^{227}Ac	actinium isotope actinium-227
^{237}Np	neptunium isotope neptunium-237
^{241}Am	americium isotope americium-241
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
HEPA	High Efficiency Particulate Air
MeV	mega electron volt
mg	milligram
NRC	U.S. Nuclear Regulatory Commission
OU	Operable Unit
PA	State of Pennsylvania
pCi	picocurie
PRG	Preliminary Remediation Goal
RAGS	Risk Assessment Guidance for Superfund
ROD	Record of Decision
RCRA	Resource Conservation and Recovery Act
Site	Safety Light Superfund Site
SLC	Safety Light Corporation
USDOT	U.S. Department of Transportation
USEI	US Ecology Idaho Inc.
USEPA	U.S. Environmental Protection Agency

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LIST OF TABLES

LIST OF ATTACHMENTS

1.0 INTRODUCTION

1.1 Purpose

The radioactive materials at the Safety Light Corporation (SLC) site (Site) located in Bloomsburg, PA are "licensed" by the State of Pennsylvania and were licensed by the U.S. Nuclear Regulatory Commission (NRC) prior to the State achieving Agreement State status. 10 CFR 20.2001 requires that waste containing licensed material be disposed of at an NRC licensed facility unless specifically authorized. The U.S. Environmental Protection Agency (USEPA), Region 3 will request approval from the State of Pennsylvania for Alternate Disposal at an authorized, non-NRC licensed, facility in accordance with 10 CFR 20.2002 (USEPA, 2012). The purpose of this Technical Memorandum is to estimate excess cancer morbidity risk for potential receptors associated with implementation of the Alternate Disposal.

1.2 Background and Problem Identification

Implementation of the OU1 selected remedy in the Record of Decision (ROD) involves demolition of 13 structures. The radioactive materials contained in the debris from the buildings to be demolished and disposed originate from the operations of the SLC in the production of luminous materials and other commercial products. The radionuclides expected in the bulk waste may include ^{227}Ac, ^{241}Am, ^{60}Co, ^{137}Cs, ^{3}H, ^{63}Ni, ^{237}Np, ^{210}Pb, ^{226}Ra, and ^{90}Sr and are present primarily as surface and volumetric contaminants on walls, ceilings, floors and on other equipment. The volume of building debris is estimated to be approximately 270,000 ft^3. The planned disposal location for these bulk materials is the US Ecology Idaho Inc. (USEI) Grand View, Idaho Subtitle C RCRA disposal facility.

USEPA's Request for Alternate Disposal, *Evaluation in Support of Alternate Waste Disposal Procedures In accordance with 10 CFR 20.2002*, dated 26 March 2012 (USEPA, 2012), provides descriptions of the specific waste transportation and handling procedures that will be implemented if Alternate Disposal is authorized and selected. The Request provides estimates of radiological dose to potential receptors to support approval of the 10 CFR 20.2002 Alternate Disposal, as one of the conditions of 10 CFR 20.2002 is based on limiting radiological dose. The Request does not provide estimates of excess cancer morbidity risk to potential receptors. This Technical Memorandum has been developed to ensure that the potential Alternate Disposal is protective under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), which is based on constraining excess cancer risk.

2.0 WASTE TRANSPORT/HANDLING RECEPTORS

The potential Alternate Disposal will involve transportation and handling of radioactively contaminated wastes from the OU1 remedial action. USEPA's request for Alternate Disposal, *Evaluation in Support of Alternate Waste Disposal Procedures In accordance with 10 CFR 20.2002* (USEPA 2012) describes the potential receptors and provides details regarding transportation and disposal logistics. This section provides details regarding how USEPA's Preliminary Remediation Goals (PRGs) for Radionuclides online calculator (http://epa-prgs.ornl.gov/cgi-bin/radionuclides/rprg_search) was used to estimate risk to each of these waste transport/handling receptors. These receptors were evaluated using the "Outdoor Worker" exposure scenario of the USEPA online PRG calculator. This scenario considers excess cancer morbidity risk from the ingestion, inhalation, and external radiation exposure pathways by default.

The "Outdoor Worker" exposure scenario was selected as the most appropriate representation for hypothetical exposures to the site-specific receptors. Each of these receptors is potentially exposed while performing outdoor activities and has a higher potential for ingestion and inhalation of contaminants than an indoor worker. In addition, the external radiation exposure pathway for the indoor worker takes credit for shielding offered by a building. Considering that there is no such shielding to the site-specific receptors, with the exception of the waste containers and vehicles, the outdoor worker scenario was used to avoid underestimating risk from the external radiation pathway.

2.1 Receptor Descriptions and Exposure Pathways

This subsection briefly describes each of the receptors that were evaluated and identifies the exposure pathways applicable to each. Additional information regarding the identification of receptors and waste transport/handling can be found in the Alternate Disposal request (USEPA 2012). Table 1 provides a summary of waste transport/handling receptors and the basis for their assumed exposure times. Table 2 identifies the exposure pathways evaluated for each receptor.

2.1.1 Truck Driver from SLC Site to Rail

This receptor is the truck driver that hauls packaged waste from the SLC Site to a nearby rail siding for loading into gondola rail cars and transport to the USEI Idaho facility.

Demolition debris from the OU1 remedial action will be packaged onsite in 20 cubic yard super sacs. The super sacs will be staged in 25 cubic yard roll-off containers and filled in place. The super sac serves as a U.S. Department of Transportation (USDOT) compliant shipping container and is sealed to prevent leakage. Tractor trailer trucks with roll-off trailers (sometimes referred to as "rocket trailers") will be used to transport the roll-off containers to the rail siding in Berwick, PA (approximately 15 miles from the Site). Based on the anticipated total waste volume, approximately 500 truck loads will be required. The time to transport the waste from the Site to the Berwick rail siding and "drop" the container is approximately 30 minutes. Based on number of truckloads, roundtrip time to the rail siding, and the estimated throughput of waste loading operations, it is assumed that three truck drivers will be used to perform this task.

As stated previously, the waste is packaged in sealed, USDOT compliant, super sacs to prevent leakage. As such, the ingestion and inhalation exposure pathways to the truck driver are considered incomplete. The external radiation exposure pathway, however, is considered complete because radiation from the waste will penetrate the waste package and container and could expose the truck driver.

2.1.2 USEI Gondola Receipt Surveyor

This receptor is the USEI employee that performs radiological receipt surveys of the gondola rail car at the rail siding in Idaho.

Gondola rail cars will be received by USEI at the rail siding in Idaho. Prior to "transloading" super sacs into end-dump trucks, each gondola car will be surveyed by radiation protection staff. Surveys involve performing radiological instrument readings and swipe testing on the outer portions of the gondola car. The time to conduct the survey averages 20 minutes. Surveys are performed by eight USEI workers.

The waste is packaged in sealed, USDOT compliant, super sacs within the gondola car to prevent leakage. As such, the ingestion and inhalation exposure pathways to the surveyor are likely incomplete pathways. However, for the purpose of conservatism, these pathways are included in this evaluation to address the unlikely potential for super sac breach during rail transportation. The external radiation exposure pathway is considered complete because radiation from the waste will penetrate the waste package and gondola and could expose the surveyor.

2.1.3 USEI Excavator Operator

This receptor is the USEI employee that removes and transloads waste from the gondola car into end-dump trucks at the rail siding using an excavator.

Waste will be removed from gondola cars and transferred into end-dumps at the rail siding using an excavator. The time to conduct the transload averages 45 minutes and is a shared task amongst four excavator operators. The excavator operator is in a HEPA ventilated enclosed cab to reduce the potential for inhalation of airborne radioactivity.

The ingestion and inhalation exposure pathways to the excavator operator are likely incomplete pathways based on work practices, respiratory protection, the low concentrations of radionuclides in the waste, and historical data. However, for the purpose of conservatism, these pathways are considered and no credit is given for respiratory protection controls. The external radiation exposure pathway is considered complete because radiation from the waste will penetrate the cab of the excavator and could expose the operator.

2.1.4 USEI Truck Driver

This receptor is the USEI employee who transports waste from the rail siding into the disposal cell via truck.

Loaded end-dump trucks will transport the waste from the rail siding into the disposal cell. The end-dump trucks have a capacity of just over 22 cubic yards for this type of waste. Based on the anticipated total waste volume, approximately 450 truck loads will be required. The time to transport the waste from the rail siding and empty it in the cell is approximately 45 minutes. Based on the number of truckloads, roundtrip time to the disposal cell from the rail siding, and the estimated throughput of waste loading operations USEI estimated that 14 drivers would be needed to support this task.

The waste is packaged in sealed, USDOT compliant, containers to prevent leakage during transport to the waste cell. As such, the ingestion and inhalation exposure pathways to the USEI truck driver are considered incomplete. The external radiation exposure pathway, however, is considered complete because radiation from the waste will penetrate the waste package and container and could expose the USEI truck driver.

2.1.5 USEI Landfill Cell Operator

This receptor is the USEI employee who spreads and compacts the waste in the landfill cell.

Loaded end-dumps will transport waste materials from the rail siding to the cell and their contents will be emptied into the cell. Materials deposited in the cell are then spread in lifts of approximately one meter and compacted by running over them with a D9 Caterpillar. The time to spread the volume of material in one gondola averages 15 minutes and is a shared task amongst two workers. All workers are required to wear respirators while in the cell. Workers are provided with half-face respirators which are assigned a protection factor of 10 under USEI's radiation protection program.

The ingestion and inhalation exposure pathways to the landfill cell operator are likely incomplete pathways based on work practices, respiratory protection, the low concentrations of radionuclides in the waste, and historical data. However, for the purpose of conservatism, these pathways are considered and no credit is given for respiratory protection controls. The external radiation exposure pathway is considered complete because radiation from the waste will penetrate the D9 Caterpillar cab and could expose the operator.

2.2 Radiological Source Term

USEPA's request for Alternate Disposal, *Evaluation in Support of Alternate Waste Disposal Procedures In accordance with 10 CFR 20.2002* (USEPA 2012) provides the maximum concentrations of radionuclides that could be shipped for Alternate Disposal based on weighted averages from OU1 Remedial Investigation data and/or professional judgment. It is extremely unlikely that waste will contain each of the potential radionuclides at its maximum concentration. However, for the purpose of conservatism, this risk evaluation assumes the waste contains the all the Site radionuclides at their maximum requested concentration. The Site radionuclides and the concentrations used in this risk evaluation are as follows:

Radionuclide	Concentration (pCi/g)
^{227}Ac	0.3
^{241}Am	5
^{60}Co	0.2
^{137}Cs	25
^{3}H	500
^{63}Ni	60
^{237}Np	0.3
^{210}Pb	140
^{226}Ra	50
^{90}Sr	500

2.3 PRG Calculator Modeling Parameters

Risk to potential receptors was evaluated using the “Outdoor Worker” exposure scenario of the USEPA online PRG calculator based on radionuclide soil concentrations identified in Section 2.2. This subsection describes site-specific parameter modifications that were used in the online PRG calculator. Table 3 provides the site-specific parameter modifications that were made in this risk evaluation. Parameter values not listed in Table 3 were not modified from their defaults.

2.3.1 Slab Size Parameter

The RAGS/HHEM Part B model assumes that an individual is exposed to a source geometry that is effectively an infinite slab. The concept of an infinite slab means that the thickness of the contaminated zone and its aerial extent are so large that it behaves as if it were infinite in its physical dimensions. This infinite slab assumption was used in the calculation of radionuclide slope factors for external radiation exposure used in the PRG calculator. For very small areas of contamination, this will result in overly conservative estimates of risk. In order to address smaller contaminated volumes, an area correction factor is incorporated into the PRG calculator. The slab size parameter is used to identify the appropriate area correction factor.

In this risk evaluation, the slab size is based on the dimensions of the waste container for transportation related receptors and on the volume of material that is spread and compacted for the landfill cell operator. A slab size of 10 square meters is assumed to represent the small side dimension of a truck for truck drivers. A slab size of 50 square meters is assumed to represent the long side dimension of a gondola for the gondola receipt surveyor and excavator operator. A slab size of 100 square meters is assumed to represent the area of waste spread and compacted for the landfill cell operator.

2.3.2 Exposure Time Related Parameters

Exposure time parameters, t_{ow} (time - outdoor worker), ED_{ow} (exposure duration - outdoor worker), and EF_{ow} (exposure frequency - outdoor worker) were modified as necessary to appropriately address the receptor’s total exposure time (see Table 1 for total exposure times). For each receptor, t_{ow} and ED_{ow} was set to 1. Exposure time (ET_{ow}) was left at the default value of 8-hours per day. EF_{ow} was modified to the number of 8-hour days that would produce the total exposure time appropriate for each receptor. This method for adjusting exposure time was employed because the inhalation and ingestion rates used in the PRG calculator are expressed in units of volume per day and mass per day, respectively. Any other method of adjusting exposure time could result in overestimation or underestimation of the inhalation and ingestion PRGs.

2.4 Risk Estimates for Waste Transport/Handling Receptors

The PRG calculator was run for each of the receptors using the parameter modifications identified in Table 3. The resulting output from the PRG calculator provided, for each receptor, the activity concentration for each radionuclide that represents an excess cancer morbidity risk of 10^{-6}, or PRGs. Table 4 provides the 10^{-6} PRG estimates.

The External Exposure PRG is used for the Site Truck Driver and the USEI Truck Driver receptors because the ingestion and inhalation pathways are incomplete. The Total PRG is used for all other receptors to address potential risk from the ingestion, inhalation, and external exposure pathways. It should be noted that PRGs are listed as “NA”, or not applicable, for ^{3}H and ^{63}Ni for the truck driver receptors. This is because ^{3}H and ^{63}Ni do not emit radiation that produces exposure via the external exposure pathway.

For each receptor, the equation below was used to estimate excess cancer morbidity risk from each radionuclide:

$$\text{Radionuclide Risk (unitless)} = \frac{\text{Radionuclide Concentration}}{\text{Radionuclide PRG}} \times 10^{-6}$$

Where:

Radionuclide concentration	= site-specific concentration from Section 2.2 (pCi/gram)
Radionuclide PRG	= result from PRG calculator (see Table 4) (pCi/gram)

Total risk to each receptor was estimated by summing the risk from each radionuclide. Table 5 provides total and radionuclide-specific risk estimates for each receptor. Estimated excess cancer morbidity risk to the Site Truck Driver is within the CERCLA acceptable risk range of 10^{-4} to 10^{-6}. Risk to each of the other waste transport/handling receptors is below the acceptable risk range.

Attachments 1 through 5 provide the output from the PRG calculator for each receptor for information purposes.

3.0 POST LANDFILL CLOSURE RESIDENT RECEPTOR

The potential Alternate Disposal will result in the disposal of Site waste contaminated with radioactive materials in a Subtitle C RCRA disposal facility. It is possible that a resident could come in contact with radioactive materials after closure of the facility. This section provides details regarding how USEPA's Preliminary Remediation Goals for Radionuclides online calculator was used to estimate risk to a hypothetical future resident receptor under a conservative (unlikely) scenario. This scenario considers excess cancer morbidity risk from the inadvertent ingestion of soil, inhalation of suspended soil, external radiation exposure, and ingestion of produce grown in contaminated soil. All default parameters were used when running the PRG calculator for this evaluation. A more realistic scenario, based on anticipated post closure conditions, is also evaluated and presented in Section 3.5.

3.1 Conservative Receptor Description and Exposure Pathways

The resident receptor is assumed to build a home on or near the surface of the landfill after it closes. The resident spends most, if not all, of the day at home except for the hours spent at work. The activities for this receptor involve typical home making chores (cooking, cleaning and laundering) as well as gardening. The resident is assumed to be exposed to contaminants via the following pathways: incidental ingestion of soil, external radiation from contaminants in soil, inhalation of fugitive dust and consumption of home grown produce (25% of fruit and vegetables). It should be noted that the present and post-closure landfill cover materials would not support crop growth. Thus, the garden-related pathways provide conservative risk estimates because an external soil source would need to used to support such activities.

Adults and children exhibit different ingestion rates for soil and produce. For example the child resident is assumed to ingest 200 mg per day while the adult ingests 100 mg per day. To take into account the different intake rate for children and adults, age adjusted intake equations were developed to account for changes in intake as the receptor ages.

It should be noted that groundwater related pathways were not included in this risk evaluation. As part of the Site 10 CFR 20.2002 request and their RCRA permit, USEI used the RESRAD computer model to estimate radiation dose to a hypothetical resident after facility closure based on the requested SLC waste stream. The model incorporates site specific parameters established from numerous, well documented, geologic and other studies performed at the facility. RESRAD's model indicated that the Site radionuclides do not "breakthrough" to the useable aquifer during the 1,000 year evaluation period (USEPA, 2012).

3.2 Radiological Source Term

The source term used in this risk evaluation is based on the radioactivity in the Site waste being distributed throughout the total waste volume of the USEI landfill. This has the effect of reducing the radioactivity concentration of the soil that the receptor may come in contact with. More specific information regarding this is documented in USEPA's request for Alternate Disposal, *Evaluation in Support of Alternate Waste Disposal Procedures In accordance with 10 CFR 20.2002* (USEPA 2012). The input concentrations of the Site radionuclides used in this evaluation are provided in Table 6.

3.3 PRG Calculator Modeling Parameters

All default values were used when running the online PRG calculator. The "slab size" was set to 10,000 square meters to approximate an infinite plane.

3.4 Upper Bound Risk Estimate for Post Landfill Closure Resident Receptor

The PRG calculator was run under the "Resident" scenario with no parameter modifications. The "Farmer" scenario was evaluated, but it was not considered a credible future use scenario for the following reasons:

- The post-closure landfill cap is in excess of ten feet thick at its thinnest point and is made of materials what would not support crop growth and livestock fodder. An external soil source would be needed to support crop growth.
- The routine operational cover materials used at UESI are made of materials what would not support crop growth and livestock fodder. An external soil source would be needed to support crop growth.
- A nearby, offsite, farmer would not encounter the radioactive contaminants because they are not readily transported to groundwater (based on RESRAD modeling documented in USEPA 2011).

The resulting output from the PRG calculator provided the activity concentration for each radionuclide that represents an excess cancer morbidity risk of 10^{-6} under this conservative, upper bounding, scenario. Table 6 provides the 10^{-6} PRG estimates.

The equation below was used to estimate excess cancer morbidity risk from each radionuclide:

$$\text{Radionuclide Risk (unitless)} = \frac{\text{Radionuclide Concentration}}{\text{Radionuclide PRG}} \times 10^{-6}$$

Where:

Radionuclide concentration = site-specific concentration (see Table 6) (pCi/gram)
Radionuclide PRG = result from PRG calculator (see Table 6) (pCi/gram)

Total risk was estimated by summing the risk from each radionuclide. Table 6 provides total and radionuclide-specific risk estimates. Estimated excess cancer morbidity risk to the residential receptors is 1.6 x 10^{-5}, which is within the CERCLA acceptable risk range of 10^{-4} to 10^{-6}.

Attachment 6 provides the output from the PRG calculator for information purposes.

It should be noted that the use of the USEPA PRG calculator to simulate conditions following landfill closure will likely overestimate risk to the hypothetical resident. The PRG calculator does not have the capability to model the cover material that would be present over the waste material at the time of landfill closure. In excess of ten feet of dense clay or similar material would serve as the cover. The PRG calculator assumes the resident's home and land surface is at the contaminated waste layer. Recognizing this assumption, it is reasonable to conclude that this risk evaluation is conservatively representative of any future resident, including the intruder who removes the cover material and constructs his/her home on the waste layer.

3.5 Risk Estimate for Post Landfill Closure Resident Receptor Under Likely Conditions

The risk estimate described in Section 3.4 provides an upper bound of excess cancer morbidity risk to a potential future resident following closure of the disposal facility. It is considered a conservative upper bound because it includes exposure pathways that are incomplete based on the presence of the landfill cap that would be installed prior to closure. The post closure cap would be in excess of ten feet at its thinnest point eliminating many potential exposure pathways. The following subsections evaluate each pathway and the impacts of the landfill cap.

Incidental Ingestion of Soil and Inhalation of Fugitive Dust
The presence of a cap in excess of ten feet thick would act as a physical barrier between the receptor and contaminated materials eliminating the potential for soil ingestion and the formation of contaminated fugitive dust. These pathways are considered incomplete under likely post closure conditions.

External Radiation
External penetrating radiation is capable of traveling through cap material, potentially resulting in dose to a future resident. However, the presence of the cap reduces the potential external radiation dose to a hypothetical receptor by: 1) increasing the distance between the contaminated materials and the receptor and 2) acting as shielding that reduces the amount of radiation that can reach the receptor.

The MircoSheild gamma transport modeling code was used to evaluate the effects of the post closure cap at the landfill surface relative to the absence of a cap. Specifically, the gamma energy fluence was estimated at one meter above the landfill surface with and without the cap present. The results are as follows (MicroSheild outputs are included as Attachments 7 and 8).

Gamma energy fluence with cap: 9×10^{-13} MeV/cm^2/second
Gamma energy fluence without cap: 1×10^{-1} MeV/cm^2/second

Excess cancer morbidity risk from gamma radiation is approximately proportional to gamma energy fluence rate. Based on the MicroShield analyses, it is apparent that the cap reduces gamma energy fluence rate by over ten orders of magnitude. On these bases, the external gamma pathway is considered incomplete under likely post closure conditions.

Consumption of Home Grown Produce
The presence of the cap would act as a physical barrier between home grown produce and contaminated materials. The thickness of the cap, ten feet, is considerably greater than the roots of home grown produce would extend. In addition, the cap is made of materials what would not support crop growth. An external soil source would be needed to support crop growth. This pathway is considered incomplete under likely post closure conditions.

Radon Inhalation
It is possible that radon resulting from the decay of ^{226}Ra present and produced in the waste could penetrate the cap and result in exposure to a hypothetical future resident. Radon is a noble gas and can travel considerable distances underground. As such, the radon pathway is considered potentially complete under likely post closure conditions.

3.5.1 Estimate of Risk Under Likely Post Closure Conditions

As described in Section 3.5, the only complete exposure pathway under likely post closure conditions is the radon pathway. As part of the Site 10 CFR 20.2002 request and their RCRA permit, USEI used the RESRAD computer model to estimate radiation dose to a hypothetical resident after facility closure based on the requested SLC waste stream. The model incorporates site specific parameters established from numerous, well documented, geologic and other studies performed at the facility and includes the post closure cap (USEPA, 2012). The RESRAD model also predicts radon transport and provides estimates of radon concentrations in ambient air. The predicted maximum radon concentrations are 2.4 x 10^{-2} pCi/m^3 indoors and 3.0 x 10^{-3} pCi/m^3 outdoors (page 24 of the Attachment 9 RESRAD output).

The PRG calculator was run under the "Resident" air scenario with no parameter modifications to provide a factor for translating the RESRAD predicted radon concentrations into excess cancer morbidity risk. The PRG calculator reported a 10^{-6} PRG for radon (Radon-222 and progeny) of 0.276 pCi/m^3 (Attachment 10).

The equation below was used to estimate excess cancer morbidity risk from radon:

$$\text{Radon Risk (unitless)} = \frac{\text{Predicted Radon Air Concentration}}{\text{Radon Air PRG}} \times 10^{-6}$$

Where:

Predicted Radon Air Concentration	= RESRAD radon concentration estimate (pCi/m^3)
Radon Air PRG	= result from PRG calculator for 10^{-6} risk (pCi/m^3)

If it is conservatively assumed that all air the receptor breathes is at the higher indoor radon concentration, the estimated excess cancer morbidity risk from radon is 8.7 x 10^{-8}.

Thus, the best estimate of excess cancer morbidity risk to a future site resident is 8.7 x 10^{-8}. A reasonable upper bound of risk is 1.6 x 10^{-5} (see Section 3.4).

4.0 CONCLUSION

This technical memorandum evaluates risk to potential receptors resulting from planned Alternate Disposal of SLC OU1 waste at USEI's Grandview Idaho facility. Receptors evaluated include waste transport workers, waste handling workers, and a resident that constructs his/her home on top of the USEI landfill after it closes. All estimated excess cancer morbidity risks are within or below the CERCLA risk range of 10^{-4} to 10^{-6} (estimated risk to four of the six receptors evaluated was below the risk range).

5.0 REFERENCES

(USEPA, 2012) *Evaluation in Support of Alternate Waste Disposal Procedures In accordance with 10 CFR 20.2002*, USEPA, Region 3, dated 26 March 2012.

TABLES

Table 1: Waste Transport/Handling Receptor Characteristics

Job Function	# of Workers	Minutes to perform task	Type of conveyance modeled	Number of Conveyances	Total Exposure time (hour)
Site Truck Driver	3	30	Truck and Trailer	500	83.3
Gondola Surveyor	8	20	Gondola	100	4.2
Excavator Operator	4	45	Gondola	100	18.8
USEI Truck Driver	14	45	Truck	450	24.1
Cell Operator	2	15	Gondola	100	12.5

Table 2: Exposure Pathways Considered for Waste Transport/Handling Receptors

Job Function	Ingestion PRG (pCi/gram)	Inhalation PRG (pCi/gram)	External Exposure PRG (pCi/gram)
Site Truck Driver			X
Gondola Surveyor	X	X	X
Excavator Operator	X	X	X
USEI Truck Driver			X
Cell Operator	X	X	X

Table 3: PRG Calculator Parameters Modified from Default for Waste Transport/Handling

Job Function	Slab size (square meters)	Time (year)	Exposure Duration (year)	Exposure Frequency (day/year) (1)
Site Truck Driver	10	1	1	10.4
Gondola Surveyor	50	1	1	0.52
Excavator Operator	50	1	1	2.34
USEI Truck Driver	10	1	1	3.01
Cell Operator	100	1	1	1.56

Note: (1) Exposure frequency based on 8-hour exposure per day and total exposure time

Table 4: Waste Transport/Handling Receptor PRG Estimates

Job Function	Radionuclide PRG for 10^{-6} risk (pCi/gram)									
	^{227}Ac	^{241}Am	^{60}Co	^{137}Cs	^{3}H	^{63}Ni	^{237}Np	^{210}Pb	^{226}Ra	^{90}Sr
Site Truck Driver	8.2E+05	1.5E+04	5.7E+01	2.4E+02	NA	NA	4.7E+02	1.7E+05	5.4E+01	1.4E+04
Gondola Surveyor	8.7E+04	9.0E+04	5.8E+02	2.4E+03	8.5E+03	5.5E+07	5.0E+03	3.2E+04	5.8E+02	1.1E+05
Excavator Operator	1.9E+04	2.0E+04	1.3E+02	5.4E+02	1.9E+03	1.2E+07	1.1E+03	7.1E+03	1.3E+02	2.4E+04
USEI Truck Driver	2.8E+06	5.3E+04	2.0E+02	8.3E+02	NA	NA	1.6E+03	5.9E+05	1.9E+02	4.8E+04
Cell Operator	2.9E+04	2.7E+04	1.6E+02	6.6E+02	2.8E+03	1.8E+07	1.4E+03	1.1E+04	1.6E+02	3.2E+04

Table 5: Waste Transport/Handling Receptor Risk Estimates

Job Function	Excess Cancer Morbidity Risk (unitless)										
	^{227}Ac	^{241}Am	^{60}Co	^{137}Cs	^{3}H	^{63}Ni	^{237}Np	^{210}Pb	^{226}Ra	^{90}Sr	Total
Site Truck Driver	3.7E-13	3.3E-10	3.5E-09	1.0E-07	0.0E+00	0.0E+00	6.4E-10	8.2E-10	9.2E-07	3.6E-08	1.1E-06
Gondola Surveyor	3.5E-12	5.6E-11	3.5E-10	1.0E-08	5.9E-08	1.1E-12	6.0E-11	4.4E-09	8.7E-08	4.7E-09	1.7E-07
Excavator Operator	1.6E-11	2.5E-10	1.6E-09	4.6E-08	2.7E-07	4.9E-12	2.7E-10	2.0E-08	3.9E-07	2.1E-08	7.5E-07
USEI Truck Driver	1.1E-13	9.4E-11	1.0E-09	3.0E-08	0.0E+00	0.0E+00	1.8E-10	2.4E-10	2.7E-07	1.0E-08	3.1E-07
Cell Operator	1.0E-11	1.9E-10	1.3E-09	3.8E-08	1.8E-07	3.3E-12	2.1E-10	1.3E-08	3.1E-07	1.6E-08	5.6E-07

Table 6: Post Landfill Closure Resident PRGs and Risk Based on All Defaults

Radionuclide	Input Concentration (pCi/gram)	PRG for 10-6 Risk (pCi/gram)	Excess Cancer Morbidity Risk (unitless)
^{227}Ac	6.20E-04	2.5E+00	2.5E-10
^{241}Am	1.03E-02	1.8E+00	5.7E-09
^{60}Co	4.10E-04	3.9E-02	1.1E-08
^{137}Cs	5.15E-02	6.2E-02	8.4E-07
^{3}H	1.03E+00	8.8E-01	1.2E-06
^{63}Ni	1.24E-01	9.8E+01	1.3E-09
^{237}Np	6.20E-04	1.2E-01	5.1E-09
^{210}Pb	2.89E-01	3.4E-01	8.6E-07
^{226}Ra	1.03E-01	1.2E-02	8.5E-06
^{90}Sr	1.03E+00	2.4E-01	4.3E-06
		Total Risk:	**1.6E-05**

ATTACHMENT 1

PRG Calculator Output for

SLC Site Truck Driver

Site-Specific

Outdoor Worker Equation Inputs for Soil

Variable	Value
Slab size for ACF (area correction factor) m^2	10
TR (target cancer risk) unitless	0.000001
t_{ow} (time - outdoor worker) yr	1
ED_{ow} (exposure duration - outdoor worker) yr	1
ET_{ow} (exposure time - outdoor worker) hr/day	8
EF_{ow} (exposure frequency - outdoor worker) day/yr	10.4
IR_{ow} (soil intake rate - outdoor worker) mg/day	100
IRA_{ow} (inhalation rate - outdoor worker) m^3/day	60
GSF_o (gamma shielding factor - outdoor) unitless	1

Output generated 04AUG2011:18:19:41

Site-Specific

Outdoor Worker PRGs for Soil

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Adult Soil Ingestion Slope Factor (risk/pCi)	Volatilization Factor (m^3/kg)	Particulate Emission Factor (m^3/kg)	Lambda	Area Correction Factor	Ingestion PRG (pCi/g)	Inhalation PRG (pCi/g)	External Exposure PRG (pCi/g)	Total PRG (pCi/g)	Total PRG (mg/kg)
Ac-227	S	1.49E-07	3.48E-10	2.01E-10	-	1.36E+09	3.18E-02	3.75E-01	4.86E+03	4.46E+04	8.20E+05	4.36E+03	6.03E-05
Am-241	M	2.81E-08	2.76E-08	9.10E-11	-	1.36E+09	1.60E-03	2.49E-01	1.06E+04	2.33E+05	1.53E+04	6.09E+03	1.78E-03
Co-60	M	3.58E-11	1.24E-05	7.33E-12	-	1.36E+09	1.31E-01	1.60E-01	1.40E+05	1.95E+08	5.66E+01	5.66E+01	5.01E-08
Cs-137+D	F	1.19E-11	2.54E-06	3.17E-11	-	1.36E+09	2.31E-02	1.75E-01	3.07E+04	5.56E+08	2.40E+02	2.38E+02	2.74E-06
H-3	M	1.99E-13	0.00E+00	2.20E-13	-	1.70E+01	5.61E-02	0.00E+00	4.49E+06	4.22E+02	-	4.22E+02	4.38E-08
Ni-63	M	1.64E-12	0.00E+00	3.50E-13	-	1.36E+09	7.22E-03	0.00E+00	2.76E+06	4.00E+09	-	2.76E+06	4.67E-02
Np-237+D	M	1.77E-08	7.96E-07	4.92E-11	-	1.36E+09	3.24E-07	2.80E-01	1.95E+04	3.69E+05	4.72E+02	4.61E+02	6.54E-01
Pb-210	M	2.77E-09	1.41E-09	5.99E-10	-	1.36E+09	3.11E-02	4.45E-01	1.63E+03	2.40E+06	1.70E+05	1.61E+03	2.12E-05
Ra-226+D	M	1.16E-08	8.49E-06	2.95E-10	-	1.36E+09	4.33E-04	2.28E-01	3.26E+03	5.63E+05	5.44E+01	5.35E+01	5.42E-05
Sr-90+D	M	1.13E-10	1.96E-08	5.92E-11	-	1.36E+09	2.38E-02	3.93E-01	1.64E+04	5.85E+07	1.38E+04	7.51E+03	5.51E-05

Output generated 04AUG2011:18:19:41

ATTACHMENT 2

PRG Calculator Output for

USEI Gondola Receipt Surveyor

Site-Specific

Outdoor Worker Equation Inputs for Soil

Variable	Value
Slab size for ACF (area correction factor) m^2	50
TR (target cancer risk) unitless	0.000001
t_{ow} (time - outdoor worker) yr	1
ED_{ow} (exposure duration - outdoor worker) yr	1
ET_{ow} (exposure time - outdoor worker) hr/day	8
EF_{ow} (exposure frequency - outdoor worker) day/yr	0.52
IR_{ow} (soil intake rate - outdoor worker) mg/day	100
IRA_{ow} (inhalation rate - outdoor worker) m^3/day	60
GSF_o (gamma shielding factor - outdoor) unitless	1

Output generated 04AUG2011:18:25:18

Site-Specific

Outdoor Worker PRGs for Soil

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Adult Soil Ingestion Slope Factor (risk/pCi)	Volatilization Factor (m^3/kg)	Particulate Emission Factor (m^3/kg)	Lambda	Area Correction Factor	Ingestion PRG (pCi/g)	Inhalation PRG (pCi/g)	External Exposure PRG (pCi/g)	Total PRG (pCi/g)	Total PRG (mg/kg)
Ac-227	S	1.49E-07	3.48E-10	2.01E-10	-	1.36E+09	3.18E-02	6.74E-01	9.72E+04	8.91E+05	9.12E+06	8.68E+04	1.20E-03
Am-241	M	2.81E-08	2.76E-08	9.10E-11	-	1.36E+09	1.60E-03	4.73E-01	2.11E+05	4.66E+06	1.61E+05	8.98E+04	2.62E-02
Co-60	M	3.58E-11	1.24E-05	7.33E-12	-	1.36E+09	1.31E-01	3.15E-01	2.80E+06	3.90E+09	5.75E+02	5.75E+02	5.09E-07
Cs-137+D	F	1.19E-11	2.54E-06	3.17E-11	-	1.36E+09	2.31E-02	3.44E-01	6.14E+05	1.11E+10	2.44E+03	2.43E+03	2.79E-05
H-3	M	1.99E-13	0.00E+00	2.20E-13	-	1.70E+01	5.61E-02	0.00E+00	8.99E+07	8.45E+03	-	8.45E+03	8.76E-07
Ni-63	M	1.64E-12	0.00E+00	3.50E-13	-	1.36E+09	7.22E-03	0.00E+00	5.51E+07	8.00E+10	-	5.51E+07	9.33E-01
Np-237+D	M	1.77E-08	7.96E-07	4.92E-11	-	1.36E+09	3.24E-07	5.21E-01	3.91E+05	7.38E+06	5.08E+03	5.01E+03	7.11E+00
Pb-210	M	2.77E-09	1.41E-09	5.99E-10	-	1.36E+09	3.11E-02	7.44E-01	3.26E+04	4.79E+07	2.04E+06	3.21E+04	4.21E-04
Ra-226+D	M	1.16E-08	8.49E-06	2.95E-10	-	1.36E+09	4.33E-04	4.27E-01	6.52E+04	1.13E+07	5.81E+02	5.76E+02	5.83E-04
Sr-90+D	M	1.13E-10	1.96E-08	5.92E-11	-	1.36E+09	2.38E-02	6.99E-01	3.29E+05	1.17E+09	1.56E+05	1.06E+05	7.75E-04

Output generated 04AUG2011:18:25:18

ATTACHMENT 3

PRG Calculator Output for

USEI Excavator Operator

Site-Specific

Outdoor Worker Equation Inputs for Soil

Variable	Value
Slab size for ACF (area correction factor) m^2	50
TR (target cancer risk) unitless	0.000001
t_{ow} (time - outdoor worker) yr	1
ED_{ow} (exposure duration - outdoor worker) yr	1
ET_{ow} (exposure time - outdoor worker) hr/day	8
EF_{ow} (exposure frequency - outdoor worker) day/yr	2.34
IR_{ow} (soil intake rate - outdoor worker) mg/day	100
IRA_{ow} (inhalation rate - outdoor worker) m^3/day	60
GSF_o (gamma shielding factor - outdoor) unitless	1

Output generated 04AUG2011:18:38:49

Site-Specific

Outdoor Worker PRGs for Soil

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Adult Soil Ingestion Slope Factor (risk/pCi)	Volatilization Factor (m^3/kg)	Particulate Emission Factor (m^3/kg)	Lambda	Area Correction Factor	Ingestion PRG (pCi/g)	Inhalation PRG (pCi/g)	External Exposure PRG (pCi/g)	Total PRG (pCi/g)	Total PRG (mg/kg)
Ac-227	S	1.49E-07	3.48E-10	2.01E-10	-	1.36E+09	3.18E-02	6.74E-01	2.16E+04	1.98E+05	2.03E+06	1.93E+04	2.67E-04
Am-241	M	2.81E-08	2.76E-08	9.10E-11	-	1.36E+09	1.60E-03	4.73E-01	4.70E+04	1.03E+06	3.59E+04	2.00E+04	5.82E-03
Co-60	M	3.58E-11	1.24E-05	7.33E-12	-	1.36E+09	1.31E-01	3.15E-01	6.22E+05	8.66E+08	1.28E+02	1.28E+02	1.13E-07
Cs-137+D	F	1.19E-11	2.54E-06	3.17E-11	-	1.36E+09	2.31E-02	3.44E-01	1.36E+05	2.47E+09	5.42E+02	5.40E+02	6.21E-06
H-3	M	1.99E-13	0.00E+00	2.20E-13	-	1.70E+01	5.61E-02	0.00E+00	2.00E+07	1.88E+03	-	1.88E+03	1.95E-07
Ni-63	M	1.64E-12	0.00E+00	3.50E-13	-	1.36E+09	7.22E-03	0.00E+00	1.23E+07	1.78E+10	-	1.22E+07	2.07E-01
Np-237+D	M	1.77E-08	7.96E-07	4.92E-11	-	1.36E+09	3.24E-07	5.21E-01	8.69E+04	1.64E+06	1.13E+03	1.11E+03	1.58E+00
Pb-210	M	2.77E-09	1.41E-09	5.99E-10	-	1.36E+09	3.11E-02	7.44E-01	7.25E+03	1.06E+07	4.53E+05	7.13E+03	9.35E-05
Ra-226+D	M	1.16E-08	8.49E-06	2.95E-10	-	1.36E+09	4.33E-04	4.27E-01	1.45E+04	2.50E+06	1.29E+02	1.28E+02	1.30E-04
Sr-90+D	M	1.13E-10	1.96E-08	5.92E-11	-	1.36E+09	2.38E-02	6.99E-01	7.30E+04	2.60E+08	3.46E+04	2.35E+04	1.72E-04

Output generated 04AUG2011:18:38:49

ATTACHMENT 4

PRG Calculator Output for

USEI Truck Driver

Site-Specific

Outdoor Worker Equation Inputs for Soil

Variable	Value
Slab size for ACF (area correction factor) m^2	10
TR (target cancer risk) unitless	0.000001
t_{ow} (time - outdoor worker) yr	1
ED_{ow} (exposure duration - outdoor worker) yr	1
ET_{ow} (exposure time - outdoor worker) hr/day	8
EF_{ow} (exposure frequency - outdoor worker) day/yr	3.01
IR_{ow} (soil intake rate - outdoor worker) mg/day	100
IRA_{ow} (inhalation rate - outdoor worker) m^3/day	60
GSF_o (gamma shielding factor - outdoor) unitless	1

Output generated 04AUG2011:18:42:03

Site-Specific

Outdoor Worker PRGs for Soil

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Adult Soil Ingestion Slope Factor (risk/pCi)	Volatilization Factor (m^3/kg)	Particulate Emission Factor (m^3/kg)	Lambda	Area Correction Factor	Ingestion PRG (pCi/g)	Inhalation PRG (pCi/g)	External Exposure PRG (pCi/g)	Total PRG (pCi/g)	Total PRG (mg/kg)
Ac-227	S	1.49E-07	3.48E-10	2.01E-10	-	1.36E+09	3.18E-02	3.75E-01	1.68E+04	1.54E+05	2.83E+06	1.51E+04	2.08E-04
Am-241	M	2.81E-08	2.76E-08	9.10E-11	-	1.36E+09	1.60E-03	2.49E-01	3.65E+04	8.04E+05	5.30E+04	2.11E+04	6.14E-03
Co-60	M	3.58E-11	1.24E-05	7.33E-12	-	1.36E+09	1.31E-01	1.60E-01	4.84E+05	6.73E+08	1.96E+02	1.96E+02	1.73E-07
Cs-137+D	F	1.19E-11	2.54E-06	3.17E-11	-	1.36E+09	2.31E-02	1.75E-01	1.06E+05	1.92E+09	8.28E+02	8.21E+02	9.45E-06
H-3	M	1.99E-13	0.00E+00	2.20E-13	-	1.70E+01	5.61E-02	0.00E+00	1.55E+07	1.46E+03	-	1.46E+03	1.51E-07
Ni-63	M	1.64E-12	0.00E+00	3.50E-13	-	1.36E+09	7.22E-03	0.00E+00	9.53E+06	1.38E+10	-	9.52E+06	1.61E-01
Np-237+D	M	1.77E-08	7.96E-07	4.92E-11	-	1.36E+09	3.24E-07	2.80E-01	6.75E+04	1.28E+06	1.63E+03	1.59E+03	2.26E+00
Pb-210	M	2.77E-09	1.41E-09	5.99E-10	-	1.36E+09	3.11E-02	4.45E-01	5.63E+03	8.28E+06	5.89E+05	5.58E+03	7.31E-05
Ra-226+D	M	1.16E-08	8.49E-06	2.95E-10	-	1.36E+09	4.33E-04	2.28E-01	1.13E+04	1.95E+06	1.88E+02	1.85E+02	1.87E-04
Sr-90+D	M	1.13E-10	1.96E-08	5.92E-11	-	1.36E+09	2.38E-02	3.93E-01	5.68E+04	2.02E+08	4.78E+04	2.59E+04	1.90E-04

Output generated 04AUG2011:18:42:03

ATTACHMENT 5

PRG Calculator Output for

USEI Landfill Cell Operator

Site-Specific

Outdoor Worker Equation Inputs for Soil

Variable	Value
Slab size for ACF (area correction factor) m^2	100
TR (target cancer risk) unitless	0.000001
t_{ow} (time - outdoor worker) yr	1
ED_{ow} (exposure duration - outdoor worker) yr	1
ET_{ow} (exposure time - outdoor worker) hr/day	8
EF_{ow} (exposure frequency - outdoor worker) day/yr	1.56
IR_{ow} (soil intake rate - outdoor worker) mg/day	100
IRA_{ow} (inhalation rate - outdoor worker) m^3/day	60
GSF_o (gamma shielding factor - outdoor) unitless	1

Output generated 04AUG2011:18:44:06

Site-Specific

Outdoor Worker PRGs for Soil

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Adult Soil Ingestion Slope Factor (risk/pCi)	Volatilization Factor (m^3/kg)	Particulate Emission Factor (m^3/kg)	Lambda	Area Correction Factor	Ingestion PRG (pCi/g)	Inhalation PRG (pCi/g)	External Exposure PRG (pCi/g)	Total PRG (pCi/g)	Total PRG (mg/kg)
Ac-227	S	1.49E-07	3.48E-10	2.01E-10	-	1.36E+09	3.18E-02	7.84E-01	3.24E+04	2.97E+05	2.61E+06	2.89E+04	4.00E-04
Am-241	M	2.81E-08	2.76E-08	9.10E-11	-	1.36E+09	1.60E-03	5.69E-01	7.05E+04	1.55E+06	4.47E+04	2.69E+04	7.84E-03
Co-60	M	3.58E-11	1.24E-05	7.33E-12	-	1.36E+09	1.31E-01	3.87E-01	9.33E+05	1.30E+09	1.56E+02	1.56E+02	1.38E-07
Cs-137+D	F	1.19E-11	2.54E-06	3.17E-11	-	1.36E+09	2.31E-02	4.22E-01	2.05E+05	3.70E+09	6.62E+02	6.60E+02	7.60E-06
H-3	M	1.99E-13	0.00E+00	2.20E-13	-	1.70E+01	5.61E-02	0.00E+00	3.00E+07	2.82E+03	-	2.82E+03	2.92E-07
Ni-63	M	1.64E-12	0.00E+00	3.50E-13	-	1.36E+09	7.22E-03	0.00E+00	1.84E+07	2.67E+10	-	1.84E+07	3.11E-01
Np-237+D	M	1.77E-08	7.96E-07	4.92E-11	-	1.36E+09	3.24E-07	6.20E-01	1.30E+05	2.46E+06	1.42E+03	1.41E+03	2.00E+00
Pb-210	M	2.77E-09	1.41E-09	5.99E-10	-	1.36E+09	3.11E-02	8.37E-01	1.09E+04	1.60E+07	6.04E+05	1.07E+04	1.40E-04
Ra-226+D	M	1.16E-08	8.49E-06	2.95E-10	-	1.36E+09	4.33E-04	5.12E-01	2.17E+04	3.76E+06	1.62E+02	1.60E+02	1.62E-04
Sr-90+D	M	1.13E-10	1.96E-08	5.92E-11	-	1.36E+09	2.38E-02	8.08E-01	1.10E+05	3.90E+08	4.49E+04	3.18E+04	2.34E-04

Output generated 04AUG2011:18:44:06

ATTACHMENT 6

PRG Calculator Output for

Upper Bound, Future Resident on Landfill Surface

Site-Specific

Resident Equation Inputs for Soil

Variable	Value
Slab size for ACF (area correction factor) m^2	10000
TR (target cancer risk) unitless	0.000001
t_r (time - resident) yr	30
ED_r (exposure duration - resident) yr	30
ET_r (exposure time - resident) hr/day	24
ET_{r-o} (exposure time - outdoor resident) hr/hr	0.073
ET_{r-i} (exposure time - indoor resident) hr/hr	0.684
ED_{r-c} (exposure duration - resident child) yr	6
ED_{r-a} (exposure duration - resident adult) yr	24
EF_r (exposure frequency - resident) day/yr	350
IRS_{r-a} (soil intake rate - resident adult) mg/day	100
IRS_{r-c} (soil intake rate - resident child) mg/day	200
IRF_{r-a} (fruit consumption rate - resident adult) mg/day	20.5
IRF_{r-c} (fruit consumption rate - resident child) mg/day	5.4
IRV_{r-a} (vegetable consumption rate - resident adult) kg/yr	10.4
IRV_{r-c} (vegetable consumption rate - resident child) kg/yr	3.8
IRA_{r-a} (inhalation rate - resident adult) m^3/day	20
IRA_{r-c} (inhalation rate - resident child) m^3/day	10
IFF_{r-adj} (age-adjusted fruit ingestion factor - resident) kg/yr	17.48
IFV_{r-adj} (age-adjusted vegetable ingestion factor - resident) kg/yr	9.08
IFS_{r-adj} (age-adjusted soil ingestion factor - resident) mg/day	120
IFA_{r-adj} (age-adjusted soil inhalation factor - resident) m^3/day	18
GSF_i (gamma shielding factor - indoor) unitless	0.4
CPF_r (contaminated plant fraction) unitless	0.25

Output generated 04AUG2011:17:21:52

Site-Specific

Resident PRGs for Soil

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Slope Factor (risk/pCi)	Soil Ingestion Slope Factor (risk/pCi)	Volatilization Factor (m^3/kg)	Particulate Emission Factor (m^3/kg)	Lambda	Area Correction Factor	Wet Soil-to-plant transfer factor	Ingestion PRG (pCi/g)	Inhalation PRG (pCi/g)	External Exposure PRG (pCi/g)	Produce Ingestion PRG (pCi/g)	Total PRG (pCi/g)	Total PRG (mg/kg)
Ac-227	S	1.49E-07	3.48E-10	2.45E-10	3.81E-10	-	1.36E+09	3.18E-02	1.00E+00	2.50E-03	3.23E+00	7.49E+01	4.47E+02	1.33E+01	2.50E+00	3.46E-08
Am-241	M	2.81E-08	2.76E-08	1.34E-10	2.17E-10	-	1.36E+09	1.60E-03	9.65E-01	1.00E-03	3.75E+00	2.62E+02	3.86E+00	4.00E+01	1.80E+00	5.25E-07
Co-60	M	3.58E-11	1.24E-05	2.23E-11	4.03E-11	-	1.36E+09	1.31E-01	8.34E-01	8.00E-02	7.92E+01	8.08E+05	3.90E-02	1.18E+01	3.89E-02	3.44E-11
Cs-137+D	F	1.19E-11	2.54E-06	3.74E-11	4.33E-11	-	1.36E+09	2.31E-02	8.77E-01	4.00E-02	2.54E+01	8.38E+05	6.24E-02	4.85E+00	6.15E-02	7.07E-10
H-3	M	1.99E-13	0.00E+00	1.44E-13	2.20E-13	-	1.70E+01	5.61E-02	0.00E+00	4.80E+00	7.46E+03	9.34E-01	-	1.57E+01	8.82E-01	9.15E-11
Ni-63	M	1.64E-12	0.00E+00	9.51E-13	1.79E-12	-	1.36E+09	7.22E-03	0.00E+00	5.00E-02	4.93E+02	4.88E+06	-	1.22E+02	9.81E+01	1.66E-06
Np-237+D	M	1.77E-08	7.96E-07	9.10E-11	1.62E-10	-	1.36E+09	3.24E-07	9.73E-01	2.00E-02	4.90E+00	4.06E+02	1.29E-01	2.88E+00	1.21E-01	1.72E-04
Pb-210	M	2.77E-09	1.41E-09	1.18E-09	1.84E-09	-	1.36E+09	3.11E-02	9.96E-01	1.00E-02	6.63E-01	3.99E+03	1.10E+02	6.82E-01	3.35E-01	4.40E-09
Ra-226+D	M	1.16E-08	8.49E-06	5.15E-10	7.30E-10	-	1.36E+09	4.33E-04	9.26E-01	4.00E-02	1.09E+00	6.24E+02	1.28E-02	2.56E-01	1.21E-02	1.22E-08
Sr-90+D	M	1.13E-10	1.96E-08	9.53E-11	1.44E-10	-	1.36E+09	2.38E-02	1.00E+00	3.00E-01	7.71E+00	8.90E+04	7.16E+00	2.56E-01	2.40E-01	1.76E-09

Output generated 04AUG2011:17:21:52

ATTACHMENT 7

MicroSheild Output for Landfill Surface with Cap Present

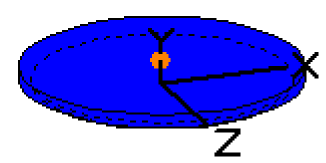
MicroShield 8.03
ACE (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Uniform Soil Contamination With CAP.msd	February 23, 2012	11:37:42 AM	00:00:00

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	100.0 cm (3 ft 3.4 in)
Radius	3.0e+3 cm (98 ft 5.1 in)



Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	504.8 cm (16 ft 6.7 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	2827.433 m³	Concrete	1.2
Shield 1	3.048 m	Concrete	1.78
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	μCi/cm³	Bq/cm³
Ac-225	3.7961e-013	1.4045e-002	1.3426e-016	4.9675e-012
Ac-227	2.0824e-006	7.7048e+004	7.3649e-010	2.7250e-005
Am-241	3.4707e-005	1.2841e+006	1.2275e-008	4.5417e-004
At-217	3.7960e-013	1.4045e-002	1.3426e-016	4.9675e-012
Ba-137m	1.6407e-004	6.0705e+006	5.8027e-008	2.1470e-003
Bi-210	1.1838e-003	4.3799e+007	4.1867e-007	1.5491e-002
Bi-211	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Bi-213	3.7960e-013	1.4045e-002	1.3426e-016	4.9675e-012
Bi-214	3.4684e-004	1.2833e+007	1.2267e-007	4.5388e-003
Co-60	1.3880e-006	5.1357e+004	4.9091e-010	1.8164e-005
Cs-137	1.7343e-004	6.4170e+006	6.1339e-008	2.2695e-003
Fr-221	3.7960e-013	1.4045e-002	1.3426e-016	4.9675e-012
Fr-223	2.8737e-008	1.0633e+003	1.0164e-011	3.7605e-007
H-3	3.4698e-003	1.2838e+008	1.2272e-006	4.5405e-002
Ni-63	4.1646e-004	1.5409e+007	1.4729e-007	5.4498e-003

Np-237	2.0822e-006	7.7040e+004	7.3642e-010	2.7247e-005
Pa-233	2.0822e-006	7.7040e+004	7.3641e-010	2.7247e-005
Pb-209	3.7959e-013	1.4045e-002	1.3425e-016	4.9673e-012
Pb-210	1.1832e-003	4.3780e+007	4.1849e-007	1.5484e-002
Pb-211	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Pb-214	3.4684e-004	1.2833e+007	1.2267e-007	4.5388e-003
Po-210	1.1983e-003	4.4335e+007	4.2380e-007	1.5680e-002
Po-211	5.7063e-009	2.1113e+002	2.0182e-012	7.4673e-008
Po-213	3.7140e-013	1.3742e-002	1.3136e-016	4.8602e-012
Po-214	3.4677e-004	1.2831e+007	1.2265e-007	4.5379e-003
Po-215	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Po-218	3.4691e-004	1.2836e+007	1.2270e-007	4.5397e-003
Ra-223	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Ra-225	3.8061e-013	1.4083e-002	1.3461e-016	4.9807e-012
Ra-226	3.4691e-004	1.2836e+007	1.2269e-007	4.5397e-003
Rn-219	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Rn-222	3.4691e-004	1.2836e+007	1.2270e-007	4.5397e-003
Sr-90	3.4697e-003	1.2838e+008	1.2271e-006	4.5404e-002
Th-227	2.0585e-006	7.6164e+004	7.2804e-010	2.6937e-005
Th-229	3.8210e-013	1.4138e-002	1.3514e-016	5.0002e-012
Tl-207	2.0845e-006	7.7127e+004	7.3725e-010	2.7278e-005
Tl-209	8.1994e-015	3.0338e-004	2.8999e-018	1.0730e-013
U-233	2.7096e-010	1.0026e+001	9.5834e-014	3.5458e-009
Y-90	3.4706e-003	1.2841e+008	1.2275e-006	4.5416e-002

Buildup: The material reference is Shield 1 Integration Parameters	
Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.330e+07	0.000e+00	6.509e-29	0.000e+00	5.583e-30
0.02	1.604e+02	0.000e+00	1.235e-33	0.000e+00	4.279e-35
0.03	4.006e+05	1.984e-278	6.820e-30	1.966e-280	6.760e-32
0.04	8.455e+04	3.419e-143	3.818e-30	1.512e-145	1.688e-32
0.05	1.922e+06	1.988e-93	2.837e-28	5.295e-96	7.557e-31
0.06	4.638e+05	1.921e-72	4.914e-28	3.815e-75	9.760e-31
0.08	3.010e+06	1.118e-53	7.587e-27	1.769e-56	1.201e-29
0.1	6.382e+04	4.534e-48	7.435e-28	6.937e-51	1.137e-30
0.15	8.872e+03	2.151e-41	5.664e-28	3.542e-44	9.327e-31
0.2	1.395e+06	1.729e-35	2.071e-25	3.052e-38	3.654e-28
0.3	2.727e+06	1.017e-30	5.354e-25	1.929e-33	1.016e-27

0.4	4.933e+06	1.556e-27	2.880e-24	3.032e-30	5.611e-27
0.5	2.296e+05	1.058e-26	8.230e-24	2.077e-29	1.616e-26
0.6	1.165e+07	2.670e-23	1.328e-20	5.211e-26	2.592e-23
0.8	1.216e+06	1.005e-21	2.472e-19	1.911e-24	4.702e-22
1.0	4.069e+06	2.532e-19	3.616e-17	4.668e-22	6.665e-20
1.5	2.495e+06	2.104e-16	1.258e-14	3.539e-19	2.117e-17
2.0	3.434e+06	2.485e-14	8.905e-13	3.843e-17	1.377e-15
Totals	**5.140e+07**	**2.506e-14**	**9.031e-13**	**3.879e-17**	**1.398e-15**

ATTACHMENT 8

MicroSheild Output for Landfill Surface with Cap Absent

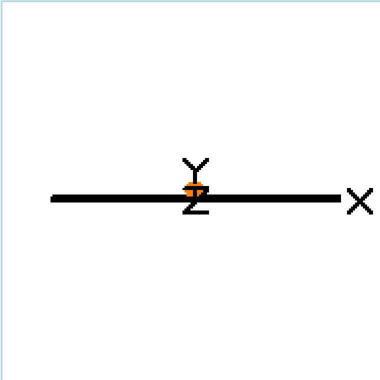
MicroShield 8.03
ACE (8.03-0000)

Date	By	Checked

Filename	Run Date	Run Time	Duration
Uniform Soil Contamination.msd	February 8, 2012	10:56:06 AM	00:00:00

Project Info	
Case Title	Case 1
Description	Case 1
Geometry	8 - Cylinder Volume - End Shields

Source Dimensions	
Height	100.0 cm (3 ft 3.4 in)
Radius	3.0e+3 cm (98 ft 5.1 in)



Dose Points			
A	X	Y	Z
#1	0.0 cm (0 in)	200.0 cm (6 ft 6.7 in)	0.0 cm (0 in)

Shields			
Shield N	Dimension	Material	Density
Source	2827.433 m³	Concrete	1.2
Air Gap		Air	0.00122

Source Input: Grouping Method - Standard Indices
Number of Groups: 25
Lower Energy Cutoff: 0.015
Photons < 0.015: Included
Library: Grove

Nuclide	Ci	Bq	μCi/cm³	Bq/cm³
Ac-225	3.7961e-013	1.4045e-002	1.3426e-016	4.9675e-012
Ac-227	2.0824e-006	7.7048e+004	7.3649e-010	2.7250e-005
Am-241	3.4707e-005	1.2841e+006	1.2275e-008	4.5417e-004
At-217	3.7960e-013	1.4045e-002	1.3426e-016	4.9675e-012
Ba-137m	1.6407e-004	6.0705e+006	5.8027e-008	2.1470e-003
Bi-210	1.1838e-003	4.3799e+007	4.1867e-007	1.5491e-002
Bi-211	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Bi-213	3.7960e-013	1.4045e-002	1.3426e-016	4.9675e-012
Bi-214	3.4684e-004	1.2833e+007	1.2267e-007	4.5388e-003
Co-60	1.3880e-006	5.1357e+004	4.9091e-010	1.8164e-005
Cs-137	1.7343e-004	6.4170e+006	6.1339e-008	2.2695e-003
Fr-221	3.7960e-013	1.4045e-002	1.3426e-016	4.9675e-012
Fr-223	2.8737e-008	1.0633e+003	1.0164e-011	3.7605e-007
H-3	3.4698e-003	1.2838e+008	1.2272e-006	4.5405e-002
Ni-63	4.1646e-004	1.5409e+007	1.4729e-007	5.4498e-003
Np-237	2.0822e-006	7.7040e+004	7.3642e-010	2.7247e-005

Pa-233	2.0822e-006	7.7040e+004	7.3641e-010	2.7247e-005
Pb-209	3.7959e-013	1.4045e-002	1.3425e-016	4.9673e-012
Pb-210	1.1832e-003	4.3780e+007	4.1849e-007	1.5484e-002
Pb-211	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Pb-214	3.4684e-004	1.2833e+007	1.2267e-007	4.5388e-003
Po-210	1.1983e-003	4.4335e+007	4.2380e-007	1.5680e-002
Po-211	5.7063e-009	2.1113e+002	2.0182e-012	7.4673e-008
Po-213	3.7140e-013	1.3742e-002	1.3136e-016	4.8602e-012
Po-214	3.4677e-004	1.2831e+007	1.2265e-007	4.5379e-003
Po-215	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Po-218	3.4691e-004	1.2836e+007	1.2270e-007	4.5397e-003
Ra-223	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Ra-225	3.8061e-013	1.4083e-002	1.3461e-016	4.9807e-012
Ra-226	3.4691e-004	1.2836e+007	1.2269e-007	4.5397e-003
Rn-219	2.0902e-006	7.7338e+004	7.3927e-010	2.7353e-005
Rn-222	3.4691e-004	1.2836e+007	1.2270e-007	4.5397e-003
Sr-90	3.4697e-003	1.2838e+008	1.2271e-006	4.5404e-002
Th-227	2.0585e-006	7.6164e+004	7.2804e-010	2.6937e-005
Th-229	3.8210e-013	1.4138e-002	1.3514e-016	5.0002e-012
Tl-207	2.0845e-006	7.7127e+004	7.3725e-010	2.7278e-005
Tl-209	8.1994e-015	3.0338e-004	2.8999e-018	1.0730e-013
U-233	2.7096e-010	1.0026e+001	9.5834e-014	3.5458e-009
Y-90	3.4706e-003	1.2841e+008	1.2275e-006	4.5416e-002

Buildup: The material reference is Source
Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy (MeV)	Activity (Photons/sec)	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.330e+07	2.125e-07	2.239e-07	1.823e-08	1.920e-08
0.02	1.604e+02	4.751e-11	5.206e-11	1.646e-12	1.803e-12
0.03	4.006e+05	1.139e-06	1.401e-06	1.129e-08	1.389e-08
0.04	8.455e+04	7.390e-07	1.074e-06	3.269e-09	4.750e-09
0.05	1.922e+06	3.412e-05	5.893e-05	9.091e-08	1.570e-07
0.06	4.638e+05	1.334e-05	2.806e-05	2.650e-08	5.574e-08
0.08	3.010e+06	1.602e-04	4.191e-04	2.535e-07	6.632e-07
0.1	6.382e+04	5.017e-06	1.472e-05	7.675e-09	2.251e-08
0.15	8.872e+03	1.284e-06	4.060e-06	2.114e-09	6.686e-09
0.2	1.395e+06	3.024e-04	9.439e-04	5.337e-07	1.666e-06
0.3	2.727e+06	1.040e-03	3.024e-03	1.973e-06	5.736e-06
0.4	4.933e+06	2.822e-03	7.656e-03	5.499e-06	1.492e-05

0.5	2.296e+05	1.807e-04	4.629e-04	3.547e-07	9.086e-07
0.6	1.165e+07	1.193e-02	2.904e-02	2.329e-05	5.668e-05
0.8	1.216e+06	1.899e-03	4.282e-03	3.612e-06	8.145e-06
1.0	4.069e+06	8.863e-03	1.889e-02	1.634e-05	3.482e-05
1.5	2.495e+06	1.005e-02	1.943e-02	1.691e-05	3.269e-05
2.0	3.434e+06	2.146e-02	3.914e-02	3.318e-05	6.052e-05
Totals	**5.140e+07**	**5.876e-02**	**1.234e-01**	**1.021e-04**	**2.170e-04**

ATTACHMENT 9

RESRAD Radon Transport Concentration Estimates

Table of Contents

Part II: Source Terms, Factors, and Parameters for Individual Pathways

Table of Contents (cont.)

Part II: Source Terms, Factors, and Parameters for Individual Pathways

Iteration Log for Computation of the Time of Maximum H-3   Dose/Source Ratio

Pathway: Water

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	DSR(t) (mrem/yr)/(pCi/g)	Step Size (years)	Step Type
0	2.16755E+02	3.18568E-07		
1	2.17114E+02	3.18571E-07	3.59654E-01	parabolic
2	2.17331E+02	3.18500E-07	2.17114E-01	parabolic
3	2.17114E+02	3.18571E-07	0.00000E+00	direct

Notes:

1) Step size always from t with current largest DSR(t) .
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but DSR(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum H-3   Dose/Source Ratio

Pathway: Plant (water dependent)

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	DSR(t) (mrem/yr)/(pCi/g)	Step Size (years)	Step Type
0	2.16755E+02	4.06446E-08		
1	2.17148E+02	4.06461E-08	3.92848E-01	parabolic
2	2.17365E+02	4.06370E-08	2.17148E-01	parabolic
3	2.17148E+02	4.06461E-08	0.00000E+00	direct

Notes:

1) Step size always from t with current largest DSR(t) .
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but DSR(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum H-3   Dose/Source Ratio
Pathway: Meat (water dependent)

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	DSR(t) (mrem/yr)/(pCi/g)	Step Size (years)	Step Type
0	2.16755E+02	1.64348E-08		
1	2.17205E+02	1.64363E-08	4.50072E-01	parabolic
2	2.17422E+02	1.64327E-08	2.17205E-01	parabolic
3	2.16988E+02	1.64371E-08	-2.17205E-01	parabolic

Notes:
1) Step size always from t with current largest DSR(t) .
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but DSR(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum H-3   Dose/Source Ratio

Pathway: Milk (water dependent)

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	DSR(t) (mrem/yr)/(pCi/g)	Step Size (years)	Step Type
0	2.16755E+02	4.42411E-08		
1	2.17130E+02	4.42420E-08	3.74822E-01	parabolic
2	2.17347E+02	4.42321E-08	2.17130E-01	parabolic
3	2.17130E+02	4.42420E-08	0.00000E+00	direct

Notes:

1) Step size always from t with current largest DSR(t) .
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but DSR(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum H-3 Dose/Source Ratio
All Pathways Summed

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	DSR(t) (mrem/yr)/(pCi/g)	Step Size (years)	Step Type
0	2.16755E+02	4.19889E-07		
1	2.17123E+02	4.19895E-07	3.68052E-01	parabolic
2	2.17340E+02	4.19801E-07	2.17123E-01	parabolic
3	2.17123E+02	4.19895E-07	0.00000E+00	direct

Notes:
1) Step size always from t with current largest DSR(t) .
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but DSR(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum Total Dose

Pathway: Water

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	TDOSE(t) (mrem/yr)	Step Size (years)	Step Type
0	2.16755E+02	3.28125E-07		
1	2.17114E+02	3.28128E-07	3.59653E-01	parabolic
2	2.17331E+02	3.28055E-07	2.17114E-01	parabolic
3	2.17114E+02	3.28128E-07	0.00000E+00	direct

Notes:

1) Step size always from t with current largest TDOSE(t).
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but TDOSE(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum Total Dose
Pathway: Plant (water dependent)

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	TDOSE(t) (mrem/yr)	Step Size (years)	Step Type
0	2.16755E+02	4.18639E-08		
1	2.17148E+02	4.18654E-08	3.92844E-01	parabolic
2	2.17365E+02	4.18561E-08	2.17148E-01	parabolic
3	2.17148E+02	4.18654E-08	0.00000E+00	direct

Notes:

1) Step size always from t with current largest TDOSE(t).
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but TDOSE(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum Total Dose
Pathway: Meat (water dependent)

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	TDOSE(t) (mrem/yr)	Step Size (years)	Step Type
0	2.16755E+02	1.69278E-08		
1	2.17205E+02	1.69294E-08	4.50070E-01	parabolic
2	2.17422E+02	1.69257E-08	2.17205E-01	parabolic
3	2.16988E+02	1.69303E-08	-2.17205E-01	parabolic

Notes:

1) Step size always from t with current largest TDOSE(t).
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but TDOSE(t) was smaller than the previous value.

Iteration Log for Computation of the Time of Maximum Total Dose
Pathway: Milk (water dependent)

Tolerance for tmax = 1.0E-03 (fractional accuracy)

Iteration Number	t (years)	TDOSE(t) (mrem/yr)	Step Size (years)	Step Type
0	2.16755E+02	4.55683E-08		
1	2.17130E+02	4.55692E-08	3.74820E-01	parabolic
2	2.17347E+02	4.55590E-08	2.17130E-01	parabolic
3	2.17130E+02	4.55692E-08	0.00000E+00	direct

Notes:

1) Step size always from t with current largest TDOSE(t).
2) Parabolic step based on parabola maximum through the current best triplet.
3) Golden section step, 0.5*(3-SQRT(5)) of larger interval bracketing maximum, taken only if trial parabolic step fails.
4) Direct step to a previous t only on last iteration and only if prior iteration met convergence test but TDOSE(t) was smaller than the previous value.

Source Factors for Ingrowth and Decay
Radioactivity Factors Only
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	ID(j,t) = THF(j)*S1(j,t)/S1(i,0) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.687E-01	9.089E-01	7.273E-01	3.848E-01	4.144E-02	7.116E-05	1.493E-14
Am-241	Am-241	1.000E+00	1.000E+00	9.984E-01	9.952E-01	9.841E-01	9.530E-01	8.518E-01	6.181E-01	2.011E-01
Am-241	Np-237+D	1.000E+00	0.000E+00	3.236E-07	9.694E-07	3.213E-06	9.487E-06	2.993E-05	7.713E-05	1.613E-04
Am-241	U-233	1.000E+00	0.000E+00	7.079E-13	6.364E-12	7.045E-11	6.273E-10	6.717E-09	5.461E-08	4.425E-07
Am-241	Th-229+D	1.000E+00	0.000E+00	2.228E-17	6.012E-16	2.220E-14	5.943E-13	2.137E-11	5.319E-10	1.520E-08
Co-60	Co-60	1.000E+00	1.000E+00	8.768E-01	6.740E-01	2.685E-01	1.935E-02	1.945E-06	7.359E-18	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.772E-01	9.330E-01	7.937E-01	5.000E-01	9.921E-02	9.766E-04	9.240E-11
H-3	H-3	1.000E+00	1.000E+00	9.454E-01	8.450E-01	5.705E-01	1.857E-01	3.652E-03	4.870E-08	4.218E-25
Ni-63	Ni-63	1.000E+00	1.000E+00	9.928E-01	9.786E-01	9.303E-01	8.052E-01	4.858E-01	1.146E-01	7.316E-04
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	9.999E-01	9.997E-01
Np-237+D	U-233	1.000E+00	0.000E+00	4.373E-06	1.312E-05	4.373E-05	1.312E-04	4.372E-04	1.311E-03	4.363E-03
Np-237+D	Th-229+D	1.000E+00	0.000E+00	2.065E-10	1.858E-09	2.064E-08	1.857E-07	2.058E-06	1.840E-05	1.998E-04
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.694E-01	9.110E-01	7.328E-01	3.936E-01	4.468E-02	8.918E-05	3.169E-14
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.996E-01	9.987E-01	9.957E-01	9.871E-01	9.576E-01	8.781E-01	6.484E-01
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	3.060E-02	8.897E-02	2.666E-01	6.019E-01	9.258E-01	8.904E-01	6.576E-01
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.765E-01	9.311E-01	7.882E-01	4.896E-01	9.252E-02	7.920E-04	4.597E-11

Source Factors for Ingrowth and Decay
Combined Radioactivity and Leaching Factors
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	SF(j,t) = THF(j)*S1(j,t)/S1(i,0) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.686E-01	9.087E-01	7.267E-01	3.838E-01	4.109E-02	6.936E-05	1.371E-14
Am-241	Am-241	1.000E+00	1.000E+00	9.983E-01	9.949E-01	9.833E-01	9.506E-01	8.446E-01	6.025E-01	1.847E-01
Am-241	Np-237+D	1.000E+00	0.000E+00	3.236E-07	9.692E-07	3.212E-06	9.474E-06	2.979E-05	7.614E-05	1.556E-04
Am-241	U-233	1.000E+00	0.000E+00	7.078E-13	6.363E-12	7.042E-11	6.265E-10	6.690E-09	5.395E-08	4.265E-07
Am-241	Th-229+D	1.000E+00	0.000E+00	2.228E-17	6.011E-16	2.219E-14	5.938E-13	2.131E-11	5.271E-10	1.478E-08
Co-60	Co-60	1.000E+00	1.000E+00	8.768E-01	6.740E-01	2.685E-01	1.935E-02	1.945E-06	7.355E-18	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.772E-01	9.330E-01	7.937E-01	4.999E-01	9.915E-02	9.748E-04	9.183E-11
H-3	H-3	1.000E+00	1.000E+00	9.357E-01	8.193E-01	5.146E-01	1.363E-01	1.303E-03	2.212E-09	1.410E-29
Ni-63	Ni-63	1.000E+00	1.000E+00	9.928E-01	9.786E-01	9.303E-01	8.052E-01	4.857E-01	1.146E-01	7.303E-04
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	9.999E-01	9.998E-01	9.993E-01	9.979E-01	9.930E-01
Np-237+D	U-233	1.000E+00	0.000E+00	4.373E-06	1.312E-05	4.372E-05	1.311E-04	4.363E-04	1.303E-03	4.275E-03
Np-237+D	Th-229+D	1.000E+00	0.000E+00	2.065E-10	1.858E-09	2.064E-08	1.856E-07	2.055E-06	1.833E-05	1.971E-04
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.694E-01	9.109E-01	7.327E-01	3.934E-01	4.460E-02	8.872E-05	3.115E-14
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.995E-01	9.986E-01	9.954E-01	9.864E-01	9.553E-01	8.717E-01	6.327E-01
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	3.060E-02	8.897E-02	2.665E-01	6.015E-01	9.237E-01	8.841E-01	6.418E-01
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.764E-01	9.308E-01	7.873E-01	4.880E-01	9.148E-02	7.655E-04	4.103E-11

The effect of volatilization was also considered when computing the source factors for H-3 and C-14.

Parameters Used for Calculating Cover Depth and Contaminated Zone Thicknesses

Cover Erosion rate (vcv): 0.000100 m/yr
Contaminated Zone Erosion rate (vcz): 0.001000 m/yr
Water Table Drop rate (vwt): 0.001000 m/yr
Precipitation rate (Pr): 0.184000 m/yr
Cover Removal Time (Tc): 3.600E+04 yr
Overhead irrigation rate (Irr): 0.200 m/yr   Runoff coefficient (Cr): 0.200
Evapotranspiration coeff. (Ce): 0.750   Infiltration rate (In): 0.087 m/yr
Bulk soil density (rhob): 1.500 g/cm**3   Effective porosity (pe): 0.000

Radio-nuclide (i)	Distribution Coefficient Kd(i),cm**3/g	Leaching Ratio q(i)
Ac-227	2.000000E+01	8.286E-03
Am-241	2.000000E+01	8.286E-03
Co-60	1.000000E+03	1.671E-04
Cs-137	2.800000E+02	5.965E-04
H-3	0.000000E+00	1.000E+00
Ni-63	1.000000E+03	1.671E-04
Np-237	2.574244E+02	6.487E-04
Pb-210	1.000000E+02	1.668E-03
Ra-226	7.000000E+01	2.382E-03
Sr-90	1.500000E+01	1.102E-02
Th-229	6.000000E+04	2.785E-06
U-233	5.000000E+01	3.331E-03

Time Dependence of Source Geometry

Time Dependence of Cover Depth [Cd(i,t)]

Nuclide (i)	Cd(i,t) (meters) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Am-241	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Co-60	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Cs-137	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
H-3	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Ni-63	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Np-237	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Pb-210	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Ra-226	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Sr-90	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
Th-229	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00
U-233	3.6000E+00	3.5999E+00	3.5997E+00	3.5990E+00	3.5970E+00	3.5900E+00	3.5700E+00	3.5000E+00

Time Dependence of Contaminated Zone Thicknesses [T(i,t)]

Nuclide	T(i,t) (meters)							
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Am-241	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Co-60	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Cs-137	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
H-3	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Ni-63	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Np-237	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Pb-210	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Ra-226	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Sr-90	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
Th-229	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01
U-233	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01	3.3600E+01

Occupancy, Cover/Depth, and Area Factors for Ground Pathway

Occupancy Factor (FO1): 0.600
Area (A): 88221. sq. meters
Initial cover depth (Cd): 3.600 meters
Initial contaminated zone thickness (T): 33.600 meters

Time Dependence of Cover/Depth Factor [FCTR_COV_DEPTH(i,t)]

Nuclide	FCTR_COV_DEPTH(i,t) (dimensionless)							
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-225	8.618E-43	8.646E-43	8.688E-43	8.856E-43	9.333E-43	1.127E-42	1.930E-42	1.267E-41
Ac-227	2.803E-45	2.803E-45	2.803E-45	2.803E-45	2.803E-45	4.204E-45	7.006E-45	4.764E-44
Am-241	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
At-217	1.365E-28	1.367E-28	1.372E-28	1.390E-28	1.440E-28	1.631E-28	2.328E-28	8.094E-28
At-218	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-137m	3.384E-27	3.390E-27	3.401E-27	3.442E-27	3.560E-27	4.008E-27	5.620E-27	1.836E-26
Bi-210	8.417E-38	8.437E-38	8.477E-38	8.619E-38	9.037E-38	1.067E-37	1.712E-37	8.981E-37
Bi-211	3.334E-32	3.340E-32	3.354E-32	3.401E-32	3.541E-32	4.076E-32	6.095E-32	2.491E-31
Bi-213	2.574E-28	2.578E-28	2.588E-28	2.620E-28	2.714E-28	3.070E-28	4.367E-28	1.499E-27
Bi-214	1.225E-21	1.227E-21	1.230E-21	1.242E-21	1.275E-21	1.400E-21	1.829E-21	4.657E-21
Co-60	1.814E-22	1.816E-22	1.821E-22	1.839E-22	1.891E-22	2.084E-22	2.751E-22	7.271E-22
Cs-137	1.682E-44	1.822E-44	1.822E-44	1.822E-44	1.962E-44	2.242E-44	4.064E-44	2.817E-43
Fr-221	1.728E-37	1.732E-37	1.740E-37	1.769E-37	1.854E-37	2.186E-37	3.497E-37	1.811E-36
Fr-223	8.340E-38	8.359E-38	8.399E-38	8.539E-38	8.953E-38	1.057E-37	1.697E-37	8.898E-37
H-3	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-233	1.340E-33	1.343E-33	1.349E-33	1.369E-33	1.428E-33	1.654E-33	2.517E-33	1.095E-32
Pb-209	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45	7.006E-45
Pb-210	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-211	1.779E-27	1.782E-27	1.788E-27	1.810E-27	1.873E-27	2.111E-27	2.971E-27	9.825E-27
Pb-214	1.184E-31	1.187E-31	1.191E-31	1.208E-31	1.256E-31	1.443E-31	2.142E-31	8.541E-31
Po-210	8.326E-26	8.340E-26	8.366E-26	8.461E-26	8.736E-26	9.773E-26	1.346E-25	4.132E-25
Po-211	8.281E-26	8.295E-26	8.321E-26	8.415E-26	8.689E-26	9.720E-26	1.339E-25	4.110E-25
Po-213	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-214	2.964E-25	2.968E-25	2.978E-25	3.011E-25	3.106E-25	3.466E-25	4.742E-25	1.419E-24
Po-215	1.355E-28	1.357E-28	1.362E-28	1.379E-28	1.429E-28	1.619E-28	2.311E-28	8.033E-28
Po-218	2.970E-25	2.975E-25	2.984E-25	3.017E-25	3.113E-25	3.474E-25	4.752E-25	1.423E-24
Ra-223	6.000E-37	6.014E-37	6.042E-37	6.141E-37	6.432E-37	7.563E-37	1.201E-36	6.069E-36
Ra-225	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	2.509E-38	2.515E-38	2.527E-38	2.570E-38	2.696E-38	3.190E-38	5.159E-38	2.774E-37
Rn-219	1.184E-31	1.187E-31	1.191E-31	1.208E-31	1.256E-31	1.443E-31	2.142E-31	8.541E-31
Rn-222	4.917E-28	4.926E-28	4.943E-28	5.004E-28	5.182E-28	5.855E-28	8.299E-28	2.814E-27
Sr-90	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-227	1.943E-34	1.948E-34	1.956E-34	1.986E-34	2.073E-34	2.410E-34	3.708E-34	1.675E-33
Th-229	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45
Tl-207	9.191E-28	9.207E-28	9.239E-28	9.352E-28	9.680E-28	1.092E-27	1.543E-27	5.167E-27
Tl-209	9.525E-23	9.539E-23	9.566E-23	9.660E-23	9.936E-23	1.096E-22	1.452E-22	3.887E-22
Tl-210	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
U-233	1.844E-39	1.849E-39	1.858E-39	1.890E-39	1.986E-39	2.362E-39	3.874E-39	2.189E-38
Y-90	1.314E-33	1.317E-33	1.323E-33	1.342E-33	1.400E-33	1.621E-33	2.468E-33	1.074E-32

Time Dependence of Area Factor [FCTR_AREA(i,t)]

Nuclide	FCTR_AREA(i,t) (dimensionless)							
(i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-225	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ac-227	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
At-217	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
At-218	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ba-137m	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Bi-210	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Bi-211	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Bi-213	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Bi-214	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Cs-137	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Fr-221	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Fr-223	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
H-3	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pa-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-209	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-211	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-214	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Po-210	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Po-211	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Po-213	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Po-214	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Po-215	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Po-218	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-223	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-225	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Rn-219	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Rn-222	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Th-227	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Th-229	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Tl-207	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Tl-209	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Tl-210	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Y-90	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00

Dose Conversion and Environmental Transport Factors for the Ground Pathway (p=1)

Nuclide (i)	DCF(i,1)*	ETFG(i,t) At Time in Years (dimensionless) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-225	6.371E-02	5.171E-43	5.185E-43	5.213E-43	5.311E-43	5.605E-43	6.754E-43	1.157E-42	7.601E-42
Ac-227	4.951E-04	1.401E-45	1.401E-45	1.401E-45	1.401E-45	1.401E-45	2.803E-45	4.204E-45	2.803E-44
Am-241	4.372E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
At-217	1.773E-03	8.190E-29	8.205E-29	8.234E-29	8.337E-29	8.639E-29	9.786E-29	1.397E-28	4.857E-28
At-218	5.847E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-137m	3.606E+00	2.030E-27	2.034E-27	2.041E-27	2.065E-27	2.136E-27	2.405E-27	3.372E-27	1.101E-26
Bi-210	3.606E-03	5.050E-38	5.062E-38	5.086E-38	5.171E-38	5.422E-38	6.399E-38	1.027E-37	5.388E-37
Bi-211	2.559E-01	2.000E-32	2.004E-32	2.012E-32	2.041E-32	2.125E-32	2.446E-32	3.657E-32	1.495E-31
Bi-213	7.660E-01	1.544E-28	1.547E-28	1.553E-28	1.572E-28	1.628E-28	1.842E-28	2.620E-28	8.996E-28
Bi-214	9.808E+00	7.352E-22	7.362E-22	7.382E-22	7.451E-22	7.653E-22	8.402E-22	1.097E-21	2.794E-21
Co-60	1.622E+01	1.088E-22	1.090E-22	1.093E-22	1.104E-22	1.135E-22	1.250E-22	1.651E-22	4.362E-22
Cs-137	7.510E-04	9.809E-45	1.121E-44	1.121E-44	1.121E-44	1.121E-44	1.401E-44	2.382E-44	1.696E-43
Fr-221	1.536E-01	1.037E-37	1.039E-37	1.044E-37	1.062E-37	1.113E-37	1.312E-37	2.098E-37	1.087E-36
Fr-223	1.980E-01	5.004E-38	5.016E-38	5.039E-38	5.124E-38	5.372E-38	6.340E-38	1.018E-37	5.339E-37
H-3	0.000E+00	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01
Ni-63	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237	7.790E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pa-233	1.020E+00	8.042E-34	8.059E-34	8.093E-34	8.213E-34	8.565E-34	9.922E-34	1.510E-33	6.570E-33
Pb-209	7.734E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45	4.204E-45
Pb-210	2.447E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-211	3.064E-01	1.067E-27	1.069E-27	1.073E-27	1.086E-27	1.124E-27	1.266E-27	1.782E-27	5.895E-27
Pb-214	1.341E+00	7.105E-32	7.119E-32	7.147E-32	7.247E-32	7.539E-32	8.657E-32	1.285E-31	5.124E-31
Po-210	5.231E-05	4.996E-26	5.004E-26	5.020E-26	5.076E-26	5.242E-26	5.864E-26	8.078E-26	2.479E-25
Po-211	4.764E-02	4.969E-26	4.977E-26	4.993E-26	5.049E-26	5.213E-26	5.832E-26	8.035E-26	2.466E-25
Po-213	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Po-214	5.138E-04	1.778E-25	1.781E-25	1.787E-25	1.806E-25	1.864E-25	2.080E-25	2.845E-25	8.517E-25
Po-215	1.016E-03	8.128E-29	8.142E-29	8.171E-29	8.274E-29	8.574E-29	9.712E-29	1.386E-28	4.820E-28
Po-218	5.642E-05	1.782E-25	1.785E-25	1.791E-25	1.810E-25	1.868E-25	2.084E-25	2.851E-25	8.536E-25
Ra-223	6.034E-01	3.600E-37	3.609E-37	3.625E-37	3.685E-37	3.859E-37	4.538E-37	7.208E-37	3.642E-36
Ra-225	1.102E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226	3.176E-02	1.505E-38	1.509E-38	1.516E-38	1.542E-38	1.618E-38	1.914E-38	3.095E-38	1.664E-37
Rn-219	3.083E-01	7.105E-32	7.119E-32	7.147E-32	7.247E-32	7.539E-32	8.657E-32	1.285E-31	5.124E-31
Rn-222	2.354E-03	2.950E-28	2.956E-28	2.966E-28	3.002E-28	3.109E-28	3.513E-28	4.979E-28	1.688E-27
Sr-90	7.043E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Th-227	5.212E-01	1.166E-34	1.169E-34	1.174E-34	1.191E-34	1.244E-34	1.446E-34	2.225E-34	1.005E-33
Th-229	3.213E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45
Tl-207	1.980E-02	5.515E-28	5.524E-28	5.543E-28	5.611E-28	5.808E-28	6.554E-28	9.257E-28	3.100E-27
Tl-209	1.293E+01	5.715E-23	5.723E-23	5.739E-23	5.796E-23	5.962E-23	6.578E-23	8.715E-23	2.332E-22
Tl-210	0.000E+00	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01
U-233	1.397E-03	1.106E-39	1.109E-39	1.115E-39	1.134E-39	1.192E-39	1.417E-39	2.324E-39	1.314E-38
Y-90	2.391E-02	7.886E-34	7.902E-34	7.936E-34	8.053E-34	8.399E-34	9.729E-34	1.481E-33	6.442E-33

* - Units are (mrem/yr)/(pCi/g) at infinite depth and area. Multiplication by ETFG(i,t) converts to site conditions.

Dose/Source Ratios for External Radiation from the Ground (p=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,1,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	3.395E-28	3.294E-28	3.101E-28	2.510E-28	1.372E-28	1.655E-29	3.931E-32	2.568E-41
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	1.330E-40	3.993E-40	9.341E-40	2.827E-39	8.420E-39	3.032E-38	1.176E-37	1.044E-36
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	8.903E-41	1.337E-39	1.562E-38	4.170E-37	1.040E-35	3.976E-34	1.290E-32	9.645E-31
Am-241	∑DSR(j)		2.220E-40	1.736E-39	1.656E-38	4.199E-37	1.040E-35	3.976E-34	1.290E-32	9.645E-31
Co-60	Co-60	1.000E+00	1.655E-21	1.453E-21	1.120E-21	4.506E-22	3.339E-23	3.698E-27	1.846E-38	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	6.853E-27	6.708E-27	6.426E-27	5.531E-27	3.604E-27	8.046E-28	1.109E-29	3.414E-36
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	8.212E-34	8.229E-34	8.263E-34	8.385E-34	8.744E-34	1.012E-33	1.539E-33	6.662E-33
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.401E-45	4.204E-45	7.847E-44
Np-237+D	Th-229+D	1.000E+00	1.100E-33	7.707E-33	4.085E-32	3.689E-31	3.196E-30	3.816E-29	4.478E-28	1.286E-26
Np-237+D	∑DSR(j)		1.921E-33	8.530E-33	4.167E-32	3.697E-31	3.197E-30	3.817E-29	4.478E-28	1.286E-26
Pb-210+D	Pb-210+D	1.000E+00	2.575E-30	2.500E-30	2.357E-30	1.917E-30	1.063E-30	1.348E-31	3.694E-34	3.980E-43
Ra-226+D	Ra-226+D	1.000E+00	7.214E-21	7.221E-21	7.233E-21	7.278E-21	7.407E-21	7.876E-21	9.386E-21	1.735E-20
Ra-226+D	Pb-210+D	1.000E+00	4.023E-32	1.192E-31	2.706E-31	7.380E-31	1.667E-30	2.837E-30	3.738E-30	8.329E-30
Ra-226+D	∑DSR(j)		7.214E-21	7.221E-21	7.233E-21	7.278E-21	7.407E-21	7.876E-21	9.386E-21	1.735E-20
Sr-90+D	Sr-90+D	1.000E+00	1.865E-35	1.825E-35	1.747E-35	1.500E-35	9.693E-36	2.105E-36	2.681E-38	5.605E-45

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Inhalation Pathway, Excluding Radon (p=2)

Parent and Progeny Principal Radionuclide Contributions Indicated

Parent	Product	Thread	DSR(j,2,t) At Time in Years (mrem/yr)/(pCi/g)							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Pathway Factors for the Inhalation Pathway (radon excluded)

Area (A): 8.8221E+04 m**2
Area Factor (FA2): 2.1097E-01
Cover Depth [Cd(0)]: 3.6000E+00 m
Contaminated Zone Thickness [T(0)]: 3.3600E+01 m

Occupancy Factor (FO2): 4.5000E-01
Annual Air Intake (F12): 8.4000E+03 m**3/yr
Mass Loading (ASR2): 1.0000E-04 g/m**3
FA2 * FO2 * F12 * ASR2: 7.9747E-02 g/yr

Depth Factor [FD(i,2,t)] (dimensionless)

Nuclide (i)	t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Am-241	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Co-60	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Cs-137	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Ni-63	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Np-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Pb-210	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Ra-226	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Sr-90	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Dose Conversion and Environmental Transport Factors for the Inhalation Pathway, Excluding Radon (p=2)

Parent (i)	Product (j)	DCF(j,2)*	ETF(j,2,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	6.724E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	4.440E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	5.400E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.350E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	2.169E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.190E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	3.190E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	6.290E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	5.400E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.350E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	2.169E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	2.320E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	8.594E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	2.320E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.308E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Parameters Used for Calculating Indoor and Outdoor Radon Flux

	*Floor Material	Cover Material	Contaminated Zone
Radon Diffusion Coefficient (m**2/s)	3.000E-07	7.233E-07	3.000E-07
Total Porosity	1.000E-01	4.130E-01	4.000E-01
Volumetric Water Content	3.000E-02	2.650E-02	2.507E-01
Bulk Density (g/cm**3)	2.400E+00	1.780E+00	1.500E+00
Rn-222 Emanation Coefficient	2.500E-01	2.500E-01	2.500E-01
Initial Thickness (m)	1.500E-01	3.600E+00	3.360E+01

Building Depth Below Ground Surface *(DMFL): 0.000E+00 (m)
Building indoor area factor *(FAI):   1.000E+00

* - Parameters are used only for indoor radon flux

Time Dependence of Outdoor Radon Flux [FLUXO(i,t)]

Nuclide (i)	FLUXO(i,t) (pCi/m**2/s) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	8.2087E-05	8.2063E-05	8.1933E-05	8.1851E-05	8.1299E-05	7.9678E-05	7.5298E-05	6.1787E-05

Time Dependence of Indoor Radon Flux [FLUXI(i,t)]

Nuclide (i)	FLUXI(i,t) (pCi/m**2/s) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.2201E-05	2.2195E-05	2.2182E-05	2.2137E-05	2.2011E-05	2.1572E-05	2.0365E-05	1.6751E-05

Parameters Used for Calculating Indoor and Outdoor Radon Concentration

Radon Vertical Dimension of Mixing (HMIX):	2.000E+00	(m)
Average Annual Wind Speed (WIND):	2.000E+00	(m/sec)
Building Room Height (HRM):	2.500E+00	(m)
Building Air Exchange Rate (REXG):	1.500E+00	(1/hr)

Time Dependence of Outdoor Radon Concentration [CRNO(i,t)]

Nuclide	CRNO(i,t) (pCi/m**3)							
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	3.0474E-03	3.0466E-03	3.0417E-03	3.0387E-03	3.0182E-03	2.9580E-03	2.7954E-03	2.2938E-03

Time Dependence of Indoor Radon Concentration [HCONC(i,r)]

Nuclide	HCONC(i,t) (pCi/m**3)							
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	2.4239E-02	2.4232E-02	2.4215E-02	2.4168E-02	2.4027E-02	2.3548E-02	2.2234E-02	1.8283E-02

Outdoor Working Levels of Radon [WLOTD(i,t)]

Nuclide (i)	WLOTD(i,t) (WL) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	4.2442E-10	4.2430E-10	4.2363E-10	4.2320E-10	4.2035E-10	4.1197E-10	3.8932E-10	3.1947E-10

Indoor Working Levels of Radon [WLIND(i,t)]

Nuclide (i)	WLIND(i,t) (WL) t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ra-226	1.0328E-07	1.0325E-07	1.0318E-07	1.0298E-07	1.0238E-07	1.0034E-07	9.4741E-08	7.7905E-08

Fraction of Time Spent Outdoors (FOTD): 2.500E-01
Fraction of Time Spent Indoors (FIND): 5.000E-01

Dose/Source Ratios for Radon Pathway (p=9)
Subpathway: Outdoor and Indoor Radon Flux
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent	Product	Thread	DSR(j,9,t) - DSRRNW(j,t) At Time in Years (mrem/yr)/(pCi/g)							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	1.939E-02	1.939E-02	1.938E-02	1.934E-02	1.923E-02	1.884E-02	1.779E-02	1.463E-02
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		1.939E-02	1.939E-02	1.938E-02	1.934E-02	1.923E-02	1.884E-02	1.779E-02	1.463E-02
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Radon Pathway (p=9)

Subpathway: Indoor Radon from Water Usage

Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSRRNW(j,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Transport Time Parameters for Unsaturated Zone Stratum No. 1

Stratum thickness [h(1)]: 1.000000 m
Bulk soil material density [rhob(1)]: 1.630000 g/cm**3
Effective porosity [peuz(1)]: 0.100000
Hydraulic conductivity [Khuz(1)]: 0.015000 m/yr
Total porosity [ptuz(1)]: 0.520000
Soil specific b parameter [buz(1)]: 11.000000
Saturation ratio [sruz(1)]: 1.000000

Radio-nuclide (i)	Distribution Coefficient Kduz(i,1), cm**3/g	Retardation Factor Rduz(i,1)	Transport Time Dtuz(i,1), yr
Ac-227	2.0000E+01	6.3692E+01	7.3378E+01
Am-241	2.0000E+01	6.3692E+01	7.3378E+01
Co-60	1.0000E+03	3.1356E+03	3.6125E+03
Cs-137	5.0000E+02	1.5683E+03	1.8068E+03
H-3	0.0000E+00	1.0000E+00	1.1521E+00
Ni-63	1.0000E+03	3.1356E+03	3.6125E+03
Np-237	2.5742E+02	8.0793E+02	9.3079E+02
Pb-210	1.0000E+02	3.1446E+02	3.6228E+02
Ra-226	7.0000E+01	2.2042E+02	2.5394E+02
Sr-90	1.1000E+02	3.4581E+02	3.9840E+02
Th-229	6.0000E+04	1.8808E+05	2.1668E+05
U-233	5.0000E+01	1.5773E+02	1.8172E+02

Transport Time Parameters for Unsaturated Zone Stratum No. 2

Stratum thickness [h(2)]: 4.600000 m
Bulk soil material density [rhob(2)]: 1.690000 g/cm**3
Effective porosity [peuz(2)]: 0.330000
Hydraulic conductivity [Khuz(2)]: 2200.000000 m/yr
Total porosity [ptuz(2)]: 0.340000
Soil specific b parameter [buz(2)]: 2.000000
Saturation ratio [sruz(2)]: 0.234893

Radio-nuclide (i)	Distribution Coefficient Kduz(i,2), cm**3/g	Retardation Factor Rduz(i,2)	Transport Time Dtuz(i,2), yr
Ac-227	2.0000E+01	4.2422E+02	1.7427E+03
Am-241	2.0000E+01	4.2422E+02	1.7427E+03
Co-60	1.0000E+03	2.1162E+04	8.6932E+04
Cs-137	2.8000E+02	5.9261E+03	2.4344E+04
H-3	0.0000E+00	1.0000E+00	4.1079E+00
Ni-63	1.0000E+03	2.1162E+04	8.6932E+04
Np-237	2.5742E+02	5.4484E+03	2.2382E+04
Pb-210	1.0000E+02	2.1171E+03	8.6969E+03
Ra-226	7.0000E+01	1.4823E+03	6.0891E+03
Sr-90	1.5000E+01	3.1842E+02	1.3080E+03
Th-229	6.0000E+04	1.2697E+06	5.2157E+06
U-233	5.0000E+01	1.0591E+03	4.3505E+03

Transport Time Parameters for Unsaturated Zone Stratum No. 3

Stratum thickness [h(3)]: 21.299999 m
Bulk soil material density [rhob(3)]: 1.300000 g/cm**3
Effective porosity [peuz(3)]: 0.400000
Hydraulic conductivity [Khuz(3)]: 900.000000 m/yr
Total porosity [ptuz(3)]: 0.520000
Soil specific b parameter [buz(3)]: 3.000000
Saturation ratio [sruz(3)]: 0.942308

Radio-nuclide (i)	Distribution Coefficient Kduz(i,3), cm**3/g	Retardation Factor Rduz(i,3)	Transport Time Dtuz(i,3), yr
Ac-227	2.0000E+01	5.4061E+01	5.0003E+03
Am-241	2.0000E+01	5.4061E+01	5.0003E+03
Co-60	1.0000E+03	2.6541E+03	2.4548E+05
Cs-137	2.8000E+02	7.4386E+02	6.8802E+04
H-3	0.0000E+00	1.0000E+00	9.2494E+01
Ni-63	1.0000E+03	2.6541E+03	2.4548E+05
Np-237	2.5742E+02	6.8396E+02	6.3262E+04
Pb-210	1.0000E+02	2.6631E+02	2.4632E+04
Ra-226	7.0000E+01	1.8671E+02	1.7270E+04
Sr-90	1.5000E+01	4.0796E+01	3.7734E+03
Th-229	6.0000E+04	1.5918E+05	1.4724E+07
U-233	5.0000E+01	1.3365E+02	1.2362E+04

Transport Time Parameters for Unsaturated Zone Stratum No. 4

Stratum thickness [h(4)]: 16.799999 m
Bulk soil material density [rhob(4)]: 1.310000 g/cm**3
Effective porosity [peuz(4)]: 0.430000
Hydraulic conductivity [Khuz(4)]: 60.000000 m/yr
Total porosity [ptuz(4)]: 0.490000
Soil specific b parameter [buz(4)]: 5.000000
Saturation ratio [sruz(4)]: 0.979592

Radio-nuclide (i)	Distribution Coefficient Kduz(i,4), cm**3/g	Retardation Factor Rduz(i,4)	Transport Time Dtuz(i,4), yr
Ac-227	2.0000E+01	5.5583E+01	4.5316E+03
Am-241	2.0000E+01	5.5583E+01	4.5316E+03
Co-60	1.0000E+03	2.7302E+03	2.2258E+05
Cs-137	2.8000E+02	7.6517E+02	6.2382E+04
H-3	0.0000E+00	1.0000E+00	8.1527E+01
Ni-63	1.0000E+03	2.7302E+03	2.2258E+05
Np-237	2.5742E+02	7.0355E+02	5.7359E+04
Pb-210	1.0000E+02	2.7392E+02	2.2332E+04
Ra-226	7.0000E+01	1.9204E+02	1.5657E+04
Sr-90	1.5000E+01	4.1938E+01	3.4191E+03
Th-229	6.0000E+04	1.6375E+05	1.3350E+07
U-233	5.0000E+01	1.3746E+02	1.1207E+04

Transport Time Parameters for Unsaturated Zone Stratum No. 5

Stratum thickness [h(5)]: 12.200000 m
Bulk soil material density [rhob(5)]: 1.500000 g/cm**3
Effective porosity [peuz(5)]: 0.150000
Hydraulic conductivity [Khuz(5)]: 0.100000 m/yr
Total porosity [ptuz(5)]: 0.520000
Soil specific b parameter [buz(5)]: 8.000000
Saturation ratio [sruz(5)]: 0.992577

Radio-nuclide (i)	Distribution Coefficient Kduz(i,5), cm**3/g	Retardation Factor Rduz(i,5)	Transport Time Dtuz(i,5), yr
Ac-227	2.0000E+01	5.9124E+01	1.2373E+03
Am-241	2.0000E+01	5.9124E+01	1.2373E+03
Co-60	1.0000E+03	2.9072E+03	6.0837E+04
Cs-137	2.8000E+02	8.1473E+02	1.7049E+04
H-3	0.0000E+00	1.0000E+00	2.0926E+01
Ni-63	1.0000E+03	2.9072E+03	6.0837E+04
Np-237	2.5742E+02	7.4912E+02	1.5677E+04
Pb-210	1.0000E+02	2.9162E+02	6.1025E+03
Ra-226	7.0000E+01	2.0443E+02	4.2781E+03
Sr-90	1.5000E+01	4.4593E+01	9.3317E+02
Th-229	6.0000E+04	1.7437E+05	3.6490E+06
U-233	5.0000E+01	1.4631E+02	3.0617E+03

Transport Time Parameters for Unsaturated Zone created by the Falling Water Table

Water table drop rate [vwt]: 0.001000 m/yr
Bulk soil material density [rhobaq]: 1.500000 g/cm**3
Effective porosity [peaq]: 0.400000
Hydraulic conductivity [Khaq]: 25.000000 m/yr
Total porosity [ptaq]: 0.430000
Soil specific b parameter [baq]: 5.000000
Saturation ratio [sruaq]: 0.930233

Radio-nuclide (i)	Distribution Coefficient Kdaq(i), cm**3/g	Retardation Factor Rduaq(i)	Minimum Transport Time Dtuaq(i), yr
Ac-227	2.0000E+01	7.6000E+01	6.0815E+03
Am-241	2.0000E+01	7.6000E+01	6.0815E+03
Co-60	1.0000E+03	3.7510E+03	Infinite
Cs-137	2.8000E+02	1.0510E+03	Infinite
H-3	0.0000E+00	1.0000E+00	8.6194E-01
Ni-63	1.0000E+03	3.7510E+03	Infinite
Np-237	2.5742E+02	9.6634E+02	Infinite
Pb-210	1.0000E+02	3.7600E+02	Infinite
Ra-226	7.0000E+01	2.6350E+02	Infinite
Sr-90	1.5000E+01	5.7250E+01	3.1977E+03
Th-229	6.0000E+04	2.2500E+05	Infinite

U-233	5.0000E+01	1.8850E+02	1.3119E+05

Dilution Factor and Rise Time Parameters for Nondispersion (ND) Model

Aquifer contamination depth at well (z):	2.02070E+02 m
Depth of water intake below water table (dw):	1.00000E+01 m
Infiltration rate (In):	8.68000E-02 m/yr
Aquifer water flow rate (Vwfr):	2.50000E-01 m/yr
Hydraulic gradient (J):	1.00000E-02
Hydraulic conductivity of aquifer (Kszh):	2.50000E+01 m/yr
Contaminated zone extent parallel to gradient (l):	5.82000E+02 m
Distance below contaminated zone to water table (h):	0.55900E+02 m
Initial thickness of uncontaminated cover (Cd):	0.36000E+01 m
Initial thickness of contaminated zone (T):	0.33600E+02 m
Effective porosity of saturated zone (pesz):	0.40000E+00

Radio-nuclide (i)	Dilution Factor f(i)	Retardation Factor Rdsz(i)	Horizontal Transport Time	Onsite Tauh(i), yr	Rise Time dt(i), yr	Decay Time Parameter 1/lamda(i),yr
Ac-227	1.000E+00	7.077E+01		6.590E+04	3.261E+03	3.141E+01
Am-241	1.000E+00	7.077E+01		6.590E+04	3.261E+03	6.235E+02
Co-60	1.000E+00	3.489E+03		3.249E+06	1.608E+05	7.604E+00
Cs-137	1.000E+00	9.777E+02		9.105E+05	4.506E+04	4.328E+01
H-3	1.000E+00	1.000E+00		9.312E+02	4.608E+01	1.782E+01
Ni-63	1.000E+00	3.489E+03		3.249E+06	1.608E+05	1.385E+02
Np-237	1.000E+00	8.990E+02		8.371E+05	4.143E+04	3.087E+06
Pb-210	1.000E+00	3.498E+02		3.258E+05	1.612E+04	3.217E+01
Ra-226	1.000E+00	2.452E+02		2.283E+05	1.130E+04	2.308E+03
Sr-90	1.000E+00	5.333E+01		4.966E+04	2.457E+03	4.201E+01
Th-229	1.000E+00	2.093E+05		1.949E+08	9.645E+06	1.059E+04
U-233	1.000E+00	1.754E+02		1.633E+05	8.084E+03	2.287E+05

Primary Parameters Used for Calculating Water/Soil
Concentration Ratios for Groundwater Pathway Segment

Model used: Nondispersion (ND)
Bulk soil density in contaminated zone (rhob): 1.500 g/cm**3

Radio-nuclide (i)	Dilution Factor f(i)	Retardation Factor Rdcz(i)	Breakthrough Time Chain year	Single Nuclide Dt(i), yr	Rise Time dt(i), yr
Ac-227	1.000E+00	1.207E+02	1.867E+04	1.867E+04	3.261E+03
Am-241	1.000E+00	1.207E+02	1.867E+04	1.867E+04	3.261E+03
Co-60	1.000E+00	5.985E+03	Infinite	Infinite	1.608E+05
Cs-137	1.000E+00	1.677E+03	Infinite	Infinite	4.506E+04
H-3	1.000E+00	1.000E+00	2.011E+02	2.011E+02	4.608E+01
Ni-63	1.000E+00	5.985E+03	Infinite	Infinite	1.608E+05
Np-237	1.000E+00	1.541E+03	1.867E+04	Infinite	4.143E+04
Pb-210	1.000E+00	5.994E+02	Infinite	Infinite	1.612E+04
Ra-226	1.000E+00	4.199E+02	Infinite	Infinite	1.130E+04
Sr-90	1.000E+00	9.076E+01	1.303E+04	1.303E+04	2.457E+03
Th-229	1.000E+00	3.591E+05	1.867E+04	Infinite	9.645E+06
U-233	1.000E+00	3.002E+02	1.867E+04	1.624E+05	8.084E+03

Water/Soil Concentration Ratios [WSR(j,1,t)] for Groundwater Pathway Segment

Parent (i)	Product (j)	Thread Fraction	WSR(j,1,t) At Time in Years (pCi/L)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.352E-04	8.886E-25
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Water/Soil Concentration Ratios [WSR(j,2,t)] for Surface Water Pathway Segment

Watershed Area (Aw) = 1.0000E+06 m**2
Contaminated Zone Area (A) = 8.8221E+04 m**2
Dilution Factor (f') = 8.8221E-02
Soil Density (rhob) = 1.5000E+00 kg/m**3

Parent (i)	Product (j)	Thread Fraction	WSR(j,2,t) At Time in Years (pCi/L)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.192E-05	7.840E-26
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Storage Times For Contaminated Foodstuffs

k	Food Item	STOR_T(k), days
1	non-leafy plants	14.
2	leafy plants	1.
3	milk	1.
4	meat	20.
5	fish	7.
6	crustacea	7.
7	well water	1.
8	surface water	1.
9	livestock fodder	45.

Storage Time Ingrowth and Decay Factors
Storage Time for k'th Foodstuff: t = STOR_T(k), days

Parent (i)	Product (j)	Thread Fraction	STOR_ID(i,j,t) = CONCE(i,j,t)/CONCE(i,i,0) t= 1.400E+01	1.000E+00	1.000E+00	2.000E+01	7.000E+00	7.000E+00	1.000E+00	1.000E+00	4.500E+01
Ac-227	Ac-227	1.000E+00	9.988E-01	9.999E-01	9.999E-01	9.983E-01	9.994E-01	9.994E-01	9.999E-01	9.999E-01	9.961E-01
Am-241	Am-241	1.000E+00	9.999E-01	1.000E+00	1.000E+00	9.999E-01	1.000E+00	1.000E+00	1.000E+00	1.000E+00	9.998E-01
Am-241	Np-237	1.000E+00	1.241E-08	8.868E-10	8.868E-10	1.774E-08	6.207E-09	6.207E-09	8.868E-10	8.868E-10	3.990E-08
Am-241	U-233	1.000E+00	1.041E-15	5.309E-18	5.309E-18	2.123E-15	2.601E-16	2.601E-16	5.309E-18	5.309E-18	1.075E-14
Am-241	Th-229	1.000E+00	1.255E-21	4.575E-25	4.575E-25	3.660E-21	1.569E-22	1.569E-22	4.575E-25	4.575E-25	4.169E-20
Co-60	Co-60	1.000E+00	9.950E-01	9.996E-01	9.996E-01	9.928E-01	9.975E-01	9.975E-01	9.996E-01	9.996E-01	9.839E-01
Cs-137	Cs-137	1.000E+00	9.991E-01	9.999E-01	9.999E-01	9.987E-01	9.996E-01	9.996E-01	9.999E-01	9.999E-01	9.972E-01
H-3	H-3	1.000E+00	9.979E-01	9.998E-01	9.998E-01	9.969E-01	9.989E-01	9.989E-01	9.998E-01	9.998E-01	9.931E-01
Ni-63	Ni-63	1.000E+00	9.997E-01	1.000E+00	1.000E+00	9.996E-01	9.999E-01	9.999E-01	1.000E+00	1.000E+00	9.991E-01
Np-237	Np-237	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237	U-233	1.000E+00	1.676E-07	1.197E-08	1.197E-08	2.395E-07	8.381E-08	8.381E-08	1.197E-08	1.197E-08	5.388E-07
Np-237	Th-229	1.000E+00	3.034E-13	1.548E-15	1.548E-15	6.191E-13	7.584E-14	7.584E-14	1.548E-15	1.548E-15	3.134E-12
Pb-210	Pb-210	1.000E+00	9.988E-01	9.999E-01	9.999E-01	9.983E-01	9.994E-01	9.994E-01	9.999E-01	9.999E-01	9.962E-01
Ra-226	Ra-226	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	9.999E-01
Ra-226	Pb-210	1.000E+00	1.191E-03	8.510E-05	8.510E-05	1.701E-03	5.955E-04	5.955E-04	8.510E-05	8.510E-05	3.822E-03
Sr-90	Sr-90	1.000E+00	9.991E-01	9.999E-01	9.999E-01	9.987E-01	9.995E-01	9.995E-01	9.999E-01	9.999E-01	9.971E-01
Th-229	Th-229	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
U-233	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
U-233	Th-229	1.000E+00	3.620E-06	2.585E-07	2.585E-07	5.171E-06	1.810E-06	1.810E-06	2.585E-07	2.585E-07	1.163E-05

CONCE(i,j,t)/CONCE(i,i,0) is the concentration ratio of Product(j) at time t to Parent(i) at start of storage time.

Storage Time Correction Factors

Drinking Water from Well and/or Surface

Harvest Time = t - 2.74E-03 yr; Consumption Time = t yr

Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,1)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Irrigation Water for Nonleafy Plants from Well and/or Surface
Harvest Time = t - 4.11E-02 yr; Consumption Time = t - 3.83E-02 yr

Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,2)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors

Irrigation Water for Leafy Plants from Well and/or Surface

Harvest Time = t - 5.48E-03 yr; Consumption Time = t - 2.74E-03 yr

Parent	Product	Thread	CFWW(j,t,3)# At Time in Years							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Irrigation Water for Livestock (Milk) Fodder from Well and/or Surface
Harvest Time = t - 1.29E-01 yr; Consumption Time = t - 1.26E-01 yr

Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,5)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors

Irrigation Water for Livestock (Meat) Fodder from Well and/or Surface

Harvest Time = t - 1.81E-01 yr; Consumption Time = t - 1.78E-01 yr

Parent (i)	Product (j)	Thread Fraction	CFWW(j,t,7)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors

Livestock (Milk) Water from Well and/or Surface

Harvest Time = t - 5.48E-03 yr; Consumption Time = t - 2.74E-03 yr

Parent	Product	Thread	CFWW(j,t,4)# At Time in Years							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors
Livestock (Meat) Water from Well and/or Surface
Harvest Time = t - 5.75E-02 yr; Consumption Time = t - 5.48E-02 yr

Parent	Product	Thread	CFWW(j,t,6)# At Time in Years							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Nonleafy Plants

Harvest Time = t - 3.83E-02 yr; Consumption Time = t yr

Parent (i)	Product (j)	Thread Fraction	CF3(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.988E-01	9.988E-01	9.988E-01	9.988E-01	9.988E-01	9.988E-01	9.988E-01
Am-241	Am-241	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.950E-01	9.950E-01	9.950E-01	9.950E-01	9.950E-01	9.950E-01	9.950E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01
H-3	H-3	1.000E+00	1.000E+00	9.979E-01	9.979E-01	9.979E-01	9.979E-01	9.979E-01	9.979E-01	9.979E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	9.997E-01	9.997E-01	9.997E-01	9.997E-01	9.997E-01	9.997E-01	9.997E-01
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.988E-01	9.988E-01	9.988E-01	9.988E-01	9.988E-01	9.988E-01	9.988E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Leafy Plants
Harvest Time = t - 2.74E-03 yr; Consumption Time = t yr

Parent (i)	Product (j)	Thread Fraction	CF3(j,2,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Livestock (Meat) Fodder

Harvest Time = t - 1.78E-01 yr; Consumption Time = t - 5.48E-02 yr

Parent (i)	Product (j)	Thread Fraction	CFLF(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.961E-01	9.961E-01	9.961E-01	9.961E-01	9.961E-01	9.961E-01	9.961E-01
Am-241	Am-241	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.839E-01	9.839E-01	9.839E-01	9.839E-01	9.839E-01	9.839E-01	9.839E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.972E-01	9.972E-01	9.972E-01	9.972E-01	9.972E-01	9.972E-01	9.972E-01
H-3	H-3	1.000E+00	1.000E+00	9.931E-01	9.931E-01	9.931E-01	9.931E-01	9.931E-01	9.931E-01	9.931E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.962E-01	9.962E-01	9.962E-01	9.962E-01	9.962E-01	9.962E-01	9.962E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.971E-01	9.971E-01	9.971E-01	9.971E-01	9.971E-01	9.971E-01	9.971E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Livestock (Milk) Fodder

Harvest Time = t - 1.26E-01 yr; Consumption Time = t - 2.74E-03 yr

Parent (i)	Product (j)	Thread Fraction	CFLF(j,2,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.961E-01	9.961E-01	9.961E-01	9.961E-01	9.961E-01	9.961E-01	9.961E-01
Am-241	Am-241	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.839E-01	9.839E-01	9.839E-01	9.839E-01	9.839E-01	9.839E-01	9.839E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.972E-01	9.972E-01	9.972E-01	9.972E-01	9.972E-01	9.972E-01	9.972E-01
H-3	H-3	1.000E+00	1.000E+00	9.931E-01	9.931E-01	9.931E-01	9.931E-01	9.931E-01	9.931E-01	9.931E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01	9.991E-01
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.962E-01	9.962E-01	9.962E-01	9.962E-01	9.962E-01	9.962E-01	9.962E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.971E-01	9.971E-01	9.971E-01	9.971E-01	9.971E-01	9.971E-01	9.971E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Meat

Harvest Time = t - 5.48E-02 yr; Consumption Time = t yr

Parent (i)	Product (j)	Thread Fraction	CF45(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.983E-01	9.983E-01	9.983E-01	9.983E-01	9.983E-01	9.983E-01	9.983E-01
Am-241	Am-241	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.928E-01	9.928E-01	9.928E-01	9.928E-01	9.928E-01	9.928E-01	9.928E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.987E-01	9.987E-01	9.987E-01	9.987E-01	9.987E-01	9.987E-01	9.987E-01
H-3	H-3	1.000E+00	1.000E+00	9.969E-01	9.969E-01	9.969E-01	9.969E-01	9.969E-01	9.969E-01	9.969E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.983E-01	9.983E-01	9.983E-01	9.983E-01	9.983E-01	9.983E-01	9.983E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.987E-01	9.987E-01	9.987E-01	9.987E-01	9.987E-01	9.987E-01	9.987E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Milk

Harvest Time = t - 2.74E-03 yr; Consumption Time = t yr

Parent (i)	Product (j)	Thread Fraction	CF45(j,2,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
H-3	H-3	1.000E+00	1.000E+00	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01	9.998E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Storage Time Correction Factors for Fish & Crustacea

Harvest Time = t - 1.92E-02 yr; Consumption Time = t yr

Parent (i)	Product (j)	Thread Fraction	CFF(j,1,t)# At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	1.000E+00	9.994E-01	9.994E-01	9.994E-01	9.994E-01	9.994E-01	9.994E-01	9.994E-01
Am-241	Am-241	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Am-241	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Co-60	Co-60	1.000E+00	1.000E+00	9.975E-01	9.975E-01	9.975E-01	9.975E-01	9.975E-01	9.975E-01	9.975E-01
Cs-137+D	Cs-137+D	1.000E+00	1.000E+00	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01	9.996E-01
H-3	H-3	1.000E+00	1.000E+00	9.989E-01	9.989E-01	9.989E-01	9.989E-01	9.989E-01	9.989E-01	9.989E-01
Ni-63	Ni-63	1.000E+00	1.000E+00	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01	9.999E-01
Np-237+D	Np-237+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	U-233	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Np-237+D	Th-229+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Pb-210+D	Pb-210+D	1.000E+00	1.000E+00	9.994E-01	9.994E-01	9.994E-01	9.994E-01	9.994E-01	9.994E-01	9.994E-01
Ra-226+D	Ra-226+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Ra-226+D	Pb-210+D	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Sr-90+D	Sr-90+D	1.000E+00	1.000E+00	9.995E-01	9.995E-01	9.995E-01	9.995E-01	9.995E-01	9.995E-01	9.995E-01

#Correction factor = (concentration in media at consumption time)/(concentration at harvest time).

Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
Root Uptake from Contaminated Soil (q=1)

Area Factor for Plant Foods [FA(3)] = 0.50

Nuclide	Depth Factor FD(i,1,t) (dimensionless)							
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Am-241	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Co-60	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Cs-137	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Ni-63	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Np-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Pb-210	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Ra-226	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Sr-90	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Th-229	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-233	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
Foliar Uptake from Contaminated Dust (q=2)

Area Factor for Plant Foods [FA(3)] = 0.50

Nuclide	Depth Factor FD(i,2,t) (dimensionless)							
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Am-241	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Co-60	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Cs-137	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
H-3	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Ni-63	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Np-237	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Pb-210	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Ra-226	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Sr-90	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Th-229	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
U-233	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
Ditch Irrigation (q=3)

Area Factor for Plant Foods [FA(3)] = 0.50

Nuclide	Depth Factor FD(i,3,t) (dimensionless)							
(i) t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Am-241	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Co-60	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Cs-137	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
H-3	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Ni-63	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Np-237	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Pb-210	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Ra-226	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Sr-90	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
Th-229	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00
U-233	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00	1.0000E+00

Area and Depth Factors for Plant (p=3), Meat (p=4), and Milk (p=5) Pathways
Overhead Irrigation (q=4)

Area Factor for Plant Foods [FA(3)] = 0.50

The Depth Factor Value
FD(i,p,q,t) = 1.0000E+00
is applicable for all radionuclides(i) and times(t).

Area and Depth Factors for Meat (p=4) and Milk (p=5) Pathways
Transfer from Livestock Water (q=5) and Soil (q=6) Intake

Area Factor for Meat and Milk [FA(p),p=4,5] = 1.00

The livestock water subpathway (q=5) and livestock soil intake subpathway (q=6) occur only for the meat (p=4) and milk (p=5) pathways.

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Root Uptake from Contaminated Soil (q=1)

Parent (i)	Product (j)	DCF(j,3)*	ETF(j,3,1,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Foliar Uptake from Contaminated Dust (q=2)

Parent	Product	DCF(j,3)*	ETF(j,3,2,t) At Time in Years (g/yr)							
(i)	(j)		0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Ditch Irrigation (q=3)

Parent (i)	Product (j)	DCF(j,3)*	ETF(j,3,3,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.815E-03	5.796E-23
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Plant Food Pathway (p=3)
Subpathway: Overhead Irrigation (q=4)

Parent	Product	DCF(j,3)*	ETF(j,3,4,t) * SF(j,t) At Time in Years (g/yr)							
(i)	(j)		0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)

Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,1,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)

Parent	Product	DCF(j,4)*	ETF(j,4,2,t) At Time in Years (g/yr)							
(i)	(j)		0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Ditch Irrigation (q=3)

Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,3,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.132E-03	7.446E-24
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Overhead Irrigation (q=4)

Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,4,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Meat Pathway (p=4)
Subpathway: Livestock Water (q=5)

Parent (i)	Product (j)	DCF(j,4)*	ETF(j,4,5,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.446E-03	1.608E-23
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)

Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,1,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)

Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)

Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,2,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)

Subpathway: Ditch Irrigation (q=3)

Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,3,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.004E-03	6.600E-24
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Overhead Irrigation (q=4)

Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,4,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Milk Pathway (p=5)
Subpathway: Livestock Water (q=5)

Parent (i)	Product (j)	DCF(j,5)*	ETF(j,5,5,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	8.579E-03	5.641E-23
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Fish Pathway (p=6)

Parent (i)	Product (j)	DCF(j,6)*	ETF(j,6,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose Conversion and Environmental Transport Factors for the Drinking Water Pathway (p=7)

Parent (i)	Product (j)	DCF(j,7)*	ETF(j,7,t) * SF(j,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.893E-02	4.532E-22
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Root Uptake from Contaminated Soil (q=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,3,1t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Foliar Uptake from Contaminated Dust (q=2)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,3,2t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Ditch Irrigation (q=3)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent	Product	Thread	DSR(j,3,3t) At Time in Years (mrem/yr)/(pCi/g)							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.458E-10	3.589E-30
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Subpathway: Overhead Irrigation (q=4)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,3,4t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Plant Foods (p=3)
Total for All Subpathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,3,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.458E-10	3.589E-30
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent	Product	Thread	DSR(j,4,1t) At Time in Years (mrem/yr)/(pCi/g)							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,2t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Ditch Irrigation (q=3)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,3t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	7.012E-11	4.611E-31
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Subpathway: Overhead Irrigation (q=4)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,4t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Detailed: EGL Vadose Zone Analysis

File   : C:\RESRAD_FAMILY\RESRAD\6.5\USERFILES\SAFETY LIGHT_ALTDISPREQUEST_MAY2011.RAD

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)

Subpathway: Livestock Water (q=5)

Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,5t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.515E-10	9.959E-31
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Meat (p=4)
Total for All Subpathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,4,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	2.216E-10	1.457E-30
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Fodder Root Uptake from Contaminated Soil (q=1)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,5,1t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Fodder Foliar Uptake from Contaminated Dust (q=2)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,5,2t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Ditch Irrigation (q=3)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,5,3t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	6.216E-11	4.087E-31
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)

Subpathway: Overhead Irrigation (q=4)

Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,5,4t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Subpathway: Livestock Water (q=5)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,5,5t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.312E-10	3.493E-30
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from Ingestion of Milk (p=5)
Total for All Subpathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent	Product	Thread	DSR(j,5,t) At Time in Years (mrem/yr)/(pCi/g)							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	5.934E-10	3.901E-30
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from the Ingestion of Fish (p=6)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,6,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose/Source Ratios for Internal Radiation from the Ingestion of Drinking Water (p=7)
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,7,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.268E-09	2.806E-29
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Plant/Air and Plant/Water Concentration Ratios

Mass loading [ASR(3)]: 1.000E-04 g/m**3
Area Factor for Mass Loading [FA(2)]: 2.110E-01

Nuclide (i)	FAR(i,3,2,1) m**3/g	FAR(i,3,2,2) m**3/g	FWR(i,3,3,1) L/g	FWR(i,3,3,2) L/g	FWR(i,3,4,1) L/g	FWR(i,3,4,2) L/g
Ac-227	5.4545E-02	2.6156E-01	2.8384E-07	4.1645E-07	3.4522E-04	1.6554E-03
Am-241	5.4545E-02	2.6156E-01	1.1354E-07	1.6658E-07	3.4522E-04	1.6554E-03
Co-60	5.4545E-02	2.6156E-01	9.2306E-06	1.2923E-05	3.4522E-04	1.6554E-03
Cs-137	5.4545E-02	2.6156E-01	4.6542E-06	6.7228E-06	3.4522E-04	1.6554E-03
H-3	5.4545E-02	2.6156E-01	7.2208E-04	1.0614E-03	0.0000E+00	0.0000E+00
Ni-63	5.4545E-02	2.6156E-01	5.7692E-06	8.0768E-06	3.4522E-04	1.6554E-03
Np-237	5.4545E-02	2.6156E-01	2.2585E-06	3.3283E-06	3.4522E-04	1.6554E-03
Pb-210	5.4545E-02	2.6156E-01	1.1325E-06	1.6640E-06	3.4522E-04	1.6554E-03
Ra-226	5.4545E-02	2.6156E-01	4.5331E-06	6.6701E-06	3.4522E-04	1.6554E-03
Sr-90	5.4545E-02	2.6156E-01	3.4015E-05	4.9972E-05	3.4522E-04	1.6554E-03
Th-229	5.4545E-02	2.6156E-01	0.0000E+00	0.0000E+00	3.4522E-04	1.6554E-03
U-233	5.4545E-02	2.6156E-01	2.8359E-07	4.1670E-07	3.4522E-04	1.6554E-03

FAR(i,p,q,k) is the plant/air concentration ratio for airborne contaminated dust,
and FWR(i,p,q,k) is the plant/water concentration ratio. See groundwater displays
for water/soil concentration ratios.

Plant/Soil Concentration Ratios, FSR(i,3,q,k,t)

Root Uptake (q=1) and Foliar Dust Deposition (q=2)
Nonleafy (k=1) and/or Leafy (k=2) Vegetables

Nuclide(i) Parent	Product	FSR(i,3,1,k)	FSR(i,3,2,1)	FSR(i,3,2,2)
Ac-227+D	Ac-227+D	2.5000E-03	1.1507E-06	5.5181E-06
Am-241	Am-241	1.0000E-03	1.1507E-06	5.5181E-06
Am-241	Np-237+D	2.0000E-02	1.1507E-06	5.5181E-06
Am-241	U-233	2.5000E-03	1.1507E-06	5.5181E-06
Am-241	Th-229+D	1.0000E-03	1.1507E-06	5.5181E-06
Co-60	Co-60	8.0000E-02	1.1507E-06	5.5181E-06
Cs-137+D	Cs-137+D	4.0000E-02	1.1507E-06	5.5181E-06
H-3	H-3	4.7826E+00	1.1507E-06	5.5181E-06
Ni-63	Ni-63	5.0000E-02	1.1507E-06	5.5181E-06
Np-237+D	Np-237+D	2.0000E-02	1.1507E-06	5.5181E-06
Np-237+D	U-233	2.5000E-03	1.1507E-06	5.5181E-06
Np-237+D	Th-229+D	1.0000E-03	1.1507E-06	5.5181E-06
Pb-210+D	Pb-210+D	1.0000E-02	1.1507E-06	5.5181E-06
Ra-226+D	Ra-226+D	4.0000E-02	1.1507E-06	5.5181E-06
Ra-226+D	Pb-210+D	1.0000E-02	1.1507E-06	5.5181E-06
Sr-90+D	Sr-90+D	3.0000E-01	1.1507E-06	5.5181E-06

Plant/Soil Concentration Ratio, FSR(j,3,q,k,t)
Ditch Irrigation (q=3)

Parent	Product	Thread	FSR(j,3,3,k,t) At Time in Years							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.785E-08	6.433E-28
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Plant/Soil Concentration Ratio, FSR(j,3,q,k,t)
Overhead Irrigation (q=4) and Nonleafy Vegetables (k=1)

Parent	Product	Thread	FSR(j,3,4,1,t) * SF(j,t) At Time in Years							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Plant/Soil Concentration Ratio, FSR(j,3,q,k,t)
Overhead Irrigation (q=4) and Leafy Vegetables (k=2)

Parent (i)	Product (j)	Thread Fraction	FSR(j,3,4,2,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Meat/Fodder, Milk/Fodder, Fodder/Air and Fodder/Water Concentration Ratios

FI(4,q):   68.0 kg/day   FI(5,q):   55.0 kg/day   q=1,2,3,4
FI(4,q):   50.0 L/day   FI(5,q): 160.0 L/day   q=5
FI(4,q):   0.5 kg/day   FI(5,q):

Nuclide (i)	FQR(i,4) d/kg	FQR(i,5) d/kg	FAR(i,3,2,3) m**3/g	FWR(i,3,3,3) L/g	FWR(i,3,4,3) L/g
Ac-227	2.0000E-05	2.0000E-05	2.8659E-01	1.3378E-07	1.8139E-03
Am-241	5.0000E-05	2.0000E-06	2.8659E-01	5.3511E-08	1.8139E-03
Co-60	2.0000E-02	2.0000E-03	2.8659E-01	3.6923E-06	1.8139E-03
Cs-137	3.0000E-02	8.0000E-03	2.8659E-01	2.0686E-06	1.8139E-03
H-3	5.7425E-03	4.3120E-03	2.8659E-01	3.3996E-04	0.0000E+00
Ni-63	5.0000E-03	2.0000E-02	2.8659E-01	2.3077E-06	1.8139E-03
Np-237	1.0000E-03	5.0000E-06	2.8659E-01	1.0698E-06	1.8139E-03
Pb-210	8.0000E-04	3.0000E-04	2.8659E-01	5.3156E-07	1.8139E-03
Ra-226	1.0000E-03	1.0000E-03	2.8659E-01	2.1370E-06	1.8139E-03
Sr-90	8.0000E-03	2.0000E-03	2.8659E-01	1.5958E-05	1.8139E-03
Th-229	1.0000E-04	5.0000E-06	2.8659E-01	0.0000E+00	1.8139E-03
U-233	3.4000E-04	6.0000E-04	2.8659E-01	1.3311E-07	1.8139E-03

FI(p,q) are the fodder (q=1,2,3,4), livestock water (q=5) and soil (q=6) intake rates;
FQR(i,p) are the transfer coefficients from contaminated fodder of livestock
water to meat (p=4) or milk (p=5). FAR(i,3,2,3) are the fodder/air
concentration ratios, and FWR(i,3,3,3) and FWR(i,3,4,3) are the fodder/
water concentration ratios for ditch and overhead irrigation, respectively.

Fodder/Soil Concentration Ratios, QSR(i,p,q,t), for Meat and Milk Pathways
Root Uptake (q=1) and Foliar Dust Deposition (q=2)

Nuclide(i) Parent	Product	QSR(i,p,1)	QSR(i,p,2)
Ac-227+D	Ac-227+D	2.5000E-03	6.0463E-06
Am-241	Am-241	1.0000E-03	6.0463E-06
Am-241	Np-237+D	2.0000E-02	6.0463E-06
Am-241	U-233	2.5000E-03	6.0463E-06
Am-241	Th-229+D	1.0000E-03	6.0463E-06
Co-60	Co-60	8.0000E-02	6.0463E-06
Cs-137+D	Cs-137+D	4.0000E-02	6.0463E-06
H-3	H-3	4.7826E+00	6.0463E-06
Ni-63	Ni-63	5.0000E-02	6.0463E-06
Np-237+D	Np-237+D	2.0000E-02	6.0463E-06
Np-237+D	U-233	2.5000E-03	6.0463E-06
Np-237+D	Th-229+D	1.0000E-03	6.0463E-06
Pb-210+D	Pb-210+D	1.0000E-02	6.0463E-06
Ra-226+D	Ra-226+D	4.0000E-02	6.0463E-06
Ra-226+D	Pb-210+D	1.0000E-02	6.0463E-06
Sr-90+D	Sr-90+D	3.0000E-01	6.0463E-06

Fodder/Soil Concentration Ratio, QSR(j,p,q,t),for Meat and Milk Pathways
Ditch Irrigation (q=3)

Parent (i)	Product (j)	Thread Fraction	QSR(j,p,3,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	4.650E-08	3.057E-28
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Fodder/Soil Concentration Ratio, QSR(j,p,q,t),for Meat and Milk Pathways
Overhead Irrigation (q=4)

Parent (i)	Product (j)	Thread Fraction	QSR(j,p,4,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Fodder/Soil Concentration Ratio, QSR(j,p,q,t),for Meat and Milk Pathways
Livestock Water (q=5)

Parent	Product	Thread	QSR(j,p,5,t) * SF(j,t) At Time in Years							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.357E-07	8.919E-28
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Meat/Soil Concentration Ratios, FSR(i,4,q,t)
Root Uptake (q=1) and Foliar Dust Deposition (q=2)

Nuclide(i) Parent	Product	FSR(i,4,1)	FSR(i,4,2)
Ac-227+D	Ac-227+D	0.0000E+00	0.0000E+00
Am-241	Am-241	0.0000E+00	0.0000E+00
Am-241	Np-237+D	0.0000E+00	0.0000E+00
Am-241	U-233	0.0000E+00	0.0000E+00
Am-241	Th-229+D	0.0000E+00	0.0000E+00
Co-60	Co-60	0.0000E+00	0.0000E+00
Cs-137+D	Cs-137+D	0.0000E+00	0.0000E+00
H-3	H-3	0.0000E+00	0.0000E+00
Ni-63	Ni-63	0.0000E+00	0.0000E+00
Np-237+D	Np-237+D	0.0000E+00	0.0000E+00
Np-237+D	U-233	0.0000E+00	0.0000E+00
Np-237+D	Th-229+D	0.0000E+00	0.0000E+00
Pb-210+D	Pb-210+D	0.0000E+00	0.0000E+00
Ra-226+D	Ra-226+D	0.0000E+00	0.0000E+00
Ra-226+D	Pb-210+D	0.0000E+00	0.0000E+00
Sr-90+D	Sr-90+D	0.0000E+00	0.0000E+00

Meat/Soil Concentration Ratio, FSR(j,4,q,t)
Ditch Irrigation (q=3)

Parent (i)	Product (j)	Thread Fraction	FSR(j,4,3,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.803E-08	1.185E-28
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Meat/Soil Concentration Ratio, FSR(j,4,q,t)
Overhead Irrigation (q=4)

Parent	Product	Thread	FSR(j,4,4,t) * SF(j,t) At Time in Years							
(i)	(j)	Fraction	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Meat/Soil Concentration Ratio, FSR(j,4,q,t)
Livestock Water (q=5)

Parent (i)	Product (j)	Thread Fraction	FSR(j,4,5,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	3.895E-08	2.561E-28
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Milk/Soil Concentration Ratios, FSR(i,5,q,t)
Root Uptake (q=1) and Foliar Dust Deposition (q=2)

Nuclide(i) Parent	Product	FSR(i,5,1)	FSR(i,5,2)
Ac-227+D	Ac-227+D	0.0000E+00	0.0000E+00
Am-241	Am-241	0.0000E+00	0.0000E+00
Am-241	Np-237+D	0.0000E+00	0.0000E+00
Am-241	U-233	0.0000E+00	0.0000E+00
Am-241	Th-229+D	0.0000E+00	0.0000E+00
Co-60	Co-60	0.0000E+00	0.0000E+00
Cs-137+D	Cs-137+D	0.0000E+00	0.0000E+00
H-3	H-3	0.0000E+00	0.0000E+00
Ni-63	Ni-63	0.0000E+00	0.0000E+00
Np-237+D	Np-237+D	0.0000E+00	0.0000E+00
Np-237+D	U-233	0.0000E+00	0.0000E+00
Np-237+D	Th-229+D	0.0000E+00	0.0000E+00
Pb-210+D	Pb-210+D	0.0000E+00	0.0000E+00
Ra-226+D	Ra-226+D	0.0000E+00	0.0000E+00
Ra-226+D	Pb-210+D	0.0000E+00	0.0000E+00
Sr-90+D	Sr-90+D	0.0000E+00	0.0000E+00

Milk/Soil Concentration Ratio, FSR(j,5,q,t)
Ditch Irrigation (q=3)

Parent (i)	Product (j)	Thread Fraction	FSR(j,5,3,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	1.091E-08	7.175E-29
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Milk/Soil Concentration Ratio, FSR(j,5,q,t)
Overhead Irrigation (q=4)

Parent (i)	Product (j)	Thread Fraction	FSR(j,5,4,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Milk/Soil Concentration Ratio, FSR(j,5,q,t)
Livestock Water (q=5)

Parent (i)	Product (j)	Thread Fraction	FSR(j,5,5,t) * SF(j,t) At Time in Years 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	9.327E-08	6.132E-28
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Dose/Source Ratios for Soil Ingestion Pathway (p=8)

Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Thread Fraction	DSR(j,8,t) At Time in Years (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	∑DSR(j)		0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

The DSR includes contributions from associated (half-life ≤ 180 days) daughters.

Dose Conversion and Environmental Transport Factors for the Soil Ingestion Pathway (p=8)

Parent (i)	Product (j)	DCF(j,8)*	ETF(j,8,t) At Time in Years (g/yr) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	1.000E+03
Ac-227+D	Ac-227+D	1.480E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Am-241	3.640E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Am-241	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Co-60	Co-60	2.690E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Cs-137+D	Cs-137+D	5.000E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
H-3	H-3	6.400E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ni-63	Ni-63	5.770E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Np-237+D	4.444E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	U-233	2.890E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Np-237+D	Th-229+D	4.027E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Pb-210+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Ra-226+D	1.321E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ra-226+D	Pb-210+D	7.276E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Sr-90+D	Sr-90+D	1.528E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

* - The dose conversion factor units are mrem/pCi.

ATTACHMENT 10

PRG Calculator Output for Future Resident Radon

Default

Resident Equation Inputs for Ambient Air

Variable	Value
TR (target cancer risk) unitless	0.000001
EF_r (exposure frequency) day/yr	350
ET_r (exposure time - resident) hr	24
ED_r (exposure duration - resident) yr	30
ED_{r-c} (exposure duration - resident child) yr	6
ED_{r-a} (exposure duration - resident adult) yr	24
t_r (time - resident) yr	30
IFA_{r-adj} (age-adjusted inhalation factor) m^3/day	18
IRA_{r-c} (inhalation rate - resident child) m^3/day	10
IRA_{r-a} (inhalation rate - resident adult) m^3/day	20
GSF_o (gamma shielding factor - outdoor) unitless	1

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Default

Resident PRGs for Ambient Air

Isotope	ICRP Lung Absorption Type	Inhalation Slope Factor (risk/pCi)	Submersion External Exposure Slope Factor (risk/yr per pCi/m^3)	Lambda	Inhalation PRG (pCi/m^3)	External Exposure PRG (pCi/m^3)	Ambient Air PRG (pCi/m^3)	Inhalation PRG (no decay) (pCi/m^3)	External Exposure PRG (no decay) (pCi/m^3)	Ambient Air PRG (no decay) (pCi/m^3)
Rn-222+D	-	1.80E-11	7.85E-09	6.62E+01	5.83E+02	8.79E+03	5.47E+02	2.94E-01	4.43E+00	2.76E-01

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Enclosure C

C.3 WASTE ACCEPTANCE CRITERIA

C.3.1 Pre-acceptance Review

The preacceptance protocol has been designed to ensure that only hazardous and radioactive material that can be properly and safely stored, treated and/or disposed of by USEI are approved for receipt at the facility. A two-step approach is taken by USEI. The first step is the chemical and/or radiological and physical characterization of the candidate waste stream by the generator. The second step is the preacceptance evaluation performed by USEI to determine the acceptability of the waste for receipt at the facility. Figure C-2 presents a logic diagram of the preacceptance protocol that is utilized at the facility.

C.3.2 Radioactive Material Waste Acceptance Criteria

The following waste acceptance criteria are established for accepting radiological contaminated waste material that is generally or specifically exempted from regulation by the Nuclear Regulatory Commission (NRC) or an Agreement State under the Atomic Energy Act of 1954 (“AEA”), as amended. Waste acceptance criteria are consistent with these restrictions.

The following five tables establish types and concentrations of radioactive materials that may be accepted. These tables are based on categories and types of radioactive material not regulated by the NRC based on statute or regulation or specifically approved by the NRC or an Agreement State for alternate disposal. The criteria are consistent with these restrictions and detailed analyses set forth in *Waste Acceptance Criteria and Justification for FUSRAP Material*, prepared by Radiation Safety Associates, Inc. (RSA) as subsequently refined, expanded and updated in *Waste Acceptance Criteria and Justification for Radioactive Material*, prepared by USEI.

Material may be accepted if the material has been specifically exempted from regulation by rule, order, license, license condition, letter of interpretation, or specific authorization under the following conditions. Thirty (30) days prior to intended shipment of such materials to the facility, USEI shall notify IDEQ of its intent to accept such exempted material and submit information describing the material’s physical, radiological and/or chemical properties, impact on the facility radioactive materials performance assessment, and the basis for determining that the material does not require disposal at a facility licensed under the AEA. The IDEQ will have 30 days from receipt of this notification to reject USEI’s determination or require further information and review. No response by IDEQ within thirty (30) days following receipt of such notice shall constitute concurrence. IDEQ concurrence is not required for generally exempted material as set forth in Table C-4.

Based on categories of waste described in the waste acceptance criteria, the concentration of the various radionuclides in the conveyance (e.g., rail car gondola, other container etc.) shall not exceed the concentration limits established in the WAC without the specific written approval of the IDEQ unless generally exempted as set forth in Table C-4. Radiological surveys will be performed as outlined in ERMP-01 to verify compliance with the WAC. If individual “pockets” of activity are detected indicating the limits may be exceeded, the RSO or RPS shall investigate the discrepancy and estimate the extent or volume of the material with the potentially elevated radiation levels. The RPS or RSO shall then make a determination on the compliance of the entire conveyance load with the appropriate WAC limits. If the conveyance is determined not to meet the limits, USEI will notify IDEQ’s RCRA Program Manager within 24 hours of a concentration based exceedance of the facility WAC to evaluate and discuss management options. The findings and resolution actions shall then be documented and submitted to the IDEQ.

The radioactive material waste acceptance criteria, when used in conjunction with an effective radiation monitoring and protection program as defined in the USEI *Radioactive Material Health and Safety Plan* and *Exempt Radioactive Materials Procedures* provides adequate protection of human health and the environment. Included within this manual are requirements for USEI to submit a written summary report of Table C.1 and 2 radioactive material waste receipts showing volumes and radionuclide concentrations disposed at the USEI site on a quarterly basis. USEI will also submit an Table C.3 through 5 annual report of exempted products devices, materials or items within 60 (sixty) days of year end (December 31st). The annual report will provide total volumes or mass of isotopes and total activity by isotope listing the activity of each radionuclide disposed during the preceding year, and the cumulative total of activity for each radionuclide disposed at the facility. The report will include an updated analysis of the impact on the facility performance assessment.

These criteria and procedures are designed to assure that the highest potential dose to a worker handling radioactive material at USEI shall not exceed 400 mrem/year TEDE dose, and that no member of the public is calculated to receive a potential dose exceeding 15 mrem/year TEDE dose, from the USEI program. TEDE is defined as the “Total Effective Dose Equivalent”, which equals the sum of external and internal exposures. The public dose limit during operational activities is limited to 100 mrem/yr TEDE dose. An annual summary report of environmental monitoring results will be submitted to the IDEQ by June 1st for the preceding year.

Materials that have a radioactive component that meets the criteria described in Tables C.1 through C.5 and are RCRA regulated material will be managed as described within this WAP for the RCRA regulated constituents.

Table C.1: Unimportant Quantities of Source Material Uniformly Dispersed* in Soil or Other Media**

Status of Equilibrium	Maximum Concentration of Source Material	Sum of Concentrations Parent(s) and all progeny present***
Natural uranium in equilibrium with progeny	422 ppm / 141 pCi/g	≤ 2000 pCi/g
Refined natural uranium (^{238}U,^{235}U,^{234}U; ^{234}Th, ^{234m}Pa, ^{231}Th)	500 ppm / 333 pCi/g	
Depleted Uranium (^{234}Th, ^{234m} Pa)	500 ppm / 169 pCi/g	
Natural thorium (^{232}Th- + ^{228}Th)	500 ppm / 110 pCi/g	
^{230}Th in equilibrium with progeny	0.01 ppm / 200 pCi/g	≤2000 pCi/g
^{230} Th (with no progeny)	0.1 ppm / ≤2000 pCi/g	
Any mixture of Thorium and Uranium	Sum of ratios ≤ 1****	≤2000 pCi/g

Table C.2: Naturally Occurring Radioactive Material Other Than Uranium and Thorium Uniformly Dispersed* in Soil or Other Media**

Status of Equilibrium	Maximum Concentration of Parent Nuclide	Sum of Concentrations of Parent and All Progeny Present***
^{226}Ra or ^{228}Ra with progeny	222 pCi/g	≤2000 pCi/g
^{210}Pb with progeny(Bi & Po-210)	666 pCi/g	≤2000 pCi/g
^{40}K	818 pCi/g	≤2000 pCi/g
Any other NORM		≤2000 pCi/g

Table C.3: Accelerator Produced Radioactive Material

Acceptable Material	Activity or Concentration
Any accelerator produced radionuclide.	All materials shall be packaged in accordance with USDOT packaging requirements. Any packages containing iodine isotopes or volatile radionuclides will have lids or covers sealed to the container with gaskets. Contamination levels on the surface of the packages shall not exceed those allowed at point of receipt by USDOT rules. Gamma or x-ray radiation levels may not exceed 10 millirem per hour anywhere on the surface of the package. All packages received shall be directly disposed in the active cell. All containers shall be certified to be 90% full.

*Average over conveyance or container. The use of the phrase “over the conveyance or container is meant to reflect the variability on the generator side. The concentration limit is the primary acceptance criteria.

**Unless, otherwise authorized by IDEQ, other Media does not include radioactively contaminated liquid (except for incidental liquids in materials). See radioactive contaminated liquid definition (definition section of Part B permit).

******* Diffuse waste with a total concentration (sum of concentrations of all radionuclides present) which is 2000 pCi/g or less may be accepted at the site (i.e., the controlling limits is 2000 pCi/g).

******** $$\frac{\text{Conc. of U in sample}}{\text{Allowable conc. of U}} + \frac{\text{Conc. of Th in Sample}}{\text{Allowable conc. of Th}} \leq 1$$

Table C.4: NRC Generally Exempted Products, Devices or Items

Exemption 10 CFR Part*	**Product, Device or Item**	**Isotope, Activity or Concentration**
30.15	As listed in the regulation.	Various isotopes and activities as set forth in 30.15
30.14, 30.18	Other materials, products or devices specifically exempted from regulation by rule, order, license, license condition, concurrence, or letter of interpretation.	Radionuclides in concentrations consistent with the exemption.
30.19	Self-luminous products containing tritium, ^{85}Kr, ^{3}H or ^{147}Pm	Activity by Manufacturing license
30.20	Gas and aerosol detectors for protection of life and property from fire	Isotope and activity by Manufacturing license
30.21	Capsules containing ^{14}C urea for *in vivo* diagnosis of humans	^{14}C, one µCi per capsule
40.13(a)	Unimportant quantity of source material: see table above	≤0.05% by weight source material
40.13(b)	Unrefined and unprocessed ore containing source material	As set forth in rule.
40.13(c)(1)	Source material in incandescent gas mantles, vacuum tubes, welding rods, electric lamps for illumination	Thorium and uranium, various amounts or concentrations, see rules
40.13(c)(2)	(i)Source material in glazed ceramic tableware (ii)Piezoelectric ceramic (iii) Glassware not including glass brick, pane glass, ceramic tile, or other glass or ceramic used in construction	≤20% by weight ≤2% by weight ≤10% by weight
40.13(c)(3)	Photographic film, negatives or prints	uranium or thorium
40.13(c)(4)	Finished product or part fabricated of or containing tungsten or magnesium-thorium alloys. Cannot treat or process chemically, metallurgically, or physically.	≤4% by weight thorium content.
40.13(c)(5)	Uranium contained in counterweights installed in aircraft, rockets, projectiles and missiles or stored or handled in connection with installation or removal of such counterweights.	Per stated conditions in rule.
40.13(c)(6)	Uranium used as shielding in shipping containers if conspicuously and legibly impressed with legend “CAUTION RADIOACTIVE SHIELDING – URANIUM” and uranium incased in at least 1/8 inch thick steel or fire resistant metal.	Depleted Uranium
40.13(c)(7)	Thorium contained in finished optical lenses	≤30% by weight thorium, per conditions in rule.
40.13(c)(8)	Thorium contained in any finished aircraft engine part containing nickel-thoria alloy.	≤4% by weight thorium, per conditions in rule.

Table C.5: Materials Specifically Exempted by the NRC Or NRC Agreement State

Exemption	Materials	Isotope, Activity or Concentration*
10 CFR 30.11**	Byproduct material exempted from NRC or Agreement State regulation by rule, order, license, license condition or letter of interpretation may be accepted as determined by specific NRC or Agreement State exemption.	Byproduct material at concentrations consistent with the exemption
10 CFR 40.14**	Source material exempted from NRC or Agreement State regulation by rule, order, license, license condition or letter of interpretation may be accepted as determined by specific NRC or Agreement State exemption.	Source material at concentrations consistent with the exemption.
10 CFR 70.17	Special Nuclear Material (SNM) exempted from NRC regulation by rule, order, license, license condition or letter of interpretation may be accepted as determined by specific NRC or Agreement State exemption.	SNM at concentrations consistent with the exemption.

*Sum of all isotopes up to a maximum concentration of 3,000 pCi/gm.

**Also includes equivalent Agreement State regulation where applicable.

Additional Information for USEI's Waste Analysis Plan

1. US Ecology Idaho, Inc. (USEI) may receive contaminated materials or other materials as described in Tables 1-5 above. USEI may not accept for disposal any material that by its possession would require USEI to have a radioactive material license from the Nuclear Regulatory Commission (NRC).

2. Unless approved in advance by USEI and IDEQ, average activity concentrations may not exceed those concentrations enumerated in Tables 1 and 2. For materials listed in these tables USEI may accept, on a case-by-case basis, material that exceeds these guidelines provided that the sum of the concentrations of all isotopes present in a conveyance does not exceed 2000 pCi/g. Additionally, for Tables 1 and 2 individual pockets of material may exceed the WAC for the radionuclides present as long as the average concentration of all radionuclides within the package or conveyance remains at or below the WAC and the highest dose rate measured on the outside of the unshielded package or conveyance does not exceed 500 microrem per hour.

3. Other items, devices or materials listed in Table 4, which are exempted in accordance with 10 CFR Parts 30, 40 or equivalent Agreement State regulations or 10 CFR Part 70 may be accepted at or below the activities (per device or item) or concentrations specified in those exemptions.

4. The generator of the exempted or accelerator produced waste must specify that the waste meets applicable acceptance criteria and/or exemption requirements.

5. In accordance with permit requirements, notification of any exceedance of the WAC will be provided to the RCRA Program Manager within 24 hours, in accordance with the permit.

Enclosure 2

Letter to Mr. Ronald Borsellino, US EPA Region III, from Mr. David J. Allard, PADEP
Dated June 11, 2013

Re: Safety Light Corporation Superfund Site (2 pages)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF RADIATION PROTECTION

FILE COPY

June 11, 2013

Mr. Ronald Borsellino, Director
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Re: Safety Light Corporation Superfund Site

Dear Mr. Borsellino,

In a letter dated November 19, 2012, EPA requested that debris resulting from the demolition of the remaining buildings at the Safety Light Corporation Superfund Site be exempted from the Safety Light Corporation radioactive material licenses in order to allow disposal of the debris at a permitted hazardous waste landfill in Idaho. A notice of this request was published in the Pennsylvania Bulletin for a 30-day public comment period on May 11, 2013. The public comment period has expired, and no comments were received. My staff has completed their review of the request, and this letter is our approval.

The Pennsylvania Department of Environmental Protection (Department) has the authority to exempt the material addressed in your request from the Safety Light Corporation licenses. The authority is granted pursuant to 25 Pa Code, §§ 215.1 and 219.5 which include by reference both the provisions of 10 CFR 20.2002 for alternative disposal and the authority to issue exemptions under 10 CFR 30.11.

Based on the analyses provided, it has been demonstrated by EPA, and Department staff has confirmed, that the proposed 10 CFR 20.2002 disposal is expected to result in negligible risk to workers and the public. The scenarios analyzed in your request relied upon conservative analyses, and each of the scenarios evaluated resulted in dose estimates of less than 1 mrem per year total dose. Therefore, the Department approves of this alternate disposal route of the waste as specified in accordance with 10 CFR 20.2002. Further, in accordance with the provisions of 10 CFR 30.11, the Department "may, upon application of any interested person or upon its own initiative, grant such exemptions from the requirements of the regulations. . . as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest."

Based on the analyses, this material is authorized for disposal as described in the submission because it poses negligible risk to public health and safety and does not involve information or activities that could potentially impact the common defense and security of the United States. Further, it is in the public interest to dispose of wastes in a controlled environment, such as that

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provided by a Subtitle C RCRA hazardous waste disposal facility. Therefore, to the extent that this material may be otherwise licensable, it is acceptable for disposal under this 10 CFR 20.2002 request and is exempt from further Department licensing requirements under 10 CFR 30.11.

Please note that on March 13, 2012, the US NRC issued clarification on the authorization for disposal of material issued under 10 CFR 20.2002 (FSME-12-025). This document addresses several possible situations and the approach for granting exemptions. In the extant case the exemption has been requested for licensed material generated in an Agreement State to be disposed in an unlicensed facility in a non-Agreement State. FSME-12-025 states (in part):

> "3. An Agreement State licensee requests authorization under the State's 20.2002-equivalent regulation to dispose of material at an unlicensed facility in a non-Agreement State (a state under NRC jurisdiction). In this situation, both the Agreement State that regulates the licensee seeking to dispose of the material at an unlicensed facility in another state would need to approve disposal under the Agreements State's 20.2002-equivalent regulation. The unlicensed facility would then need to obtain a license or an exemption from the NRC prior to accepting the material for disposal."

Based on our understanding of FSME-12-025, the disposal facility, i.e., US Ecology Idaho will need to obtain an exemption from NRC for disposal of this material in their facility.

Please feel free to contact Bryan Werner of my staff at (717) 787-2781 if you have any questions.

Sincerely,

David J. Allard, CHP
Director
Bureau of Radiation Protection